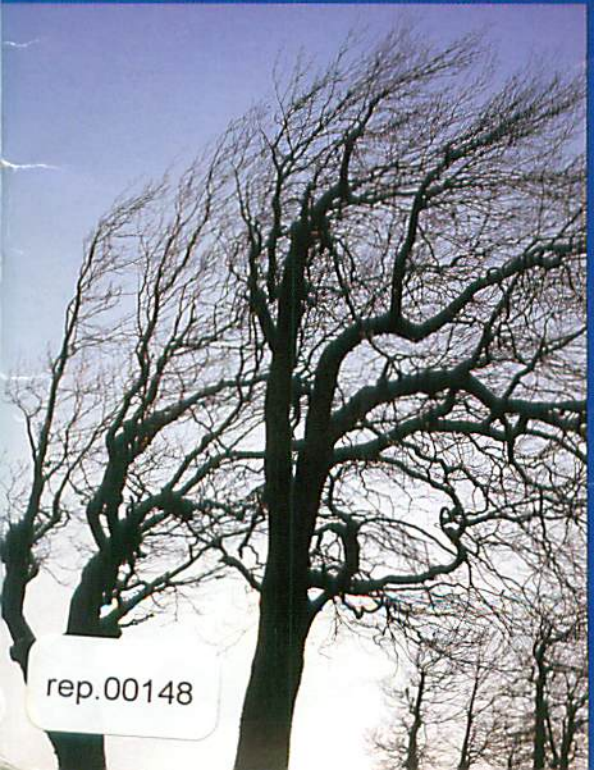
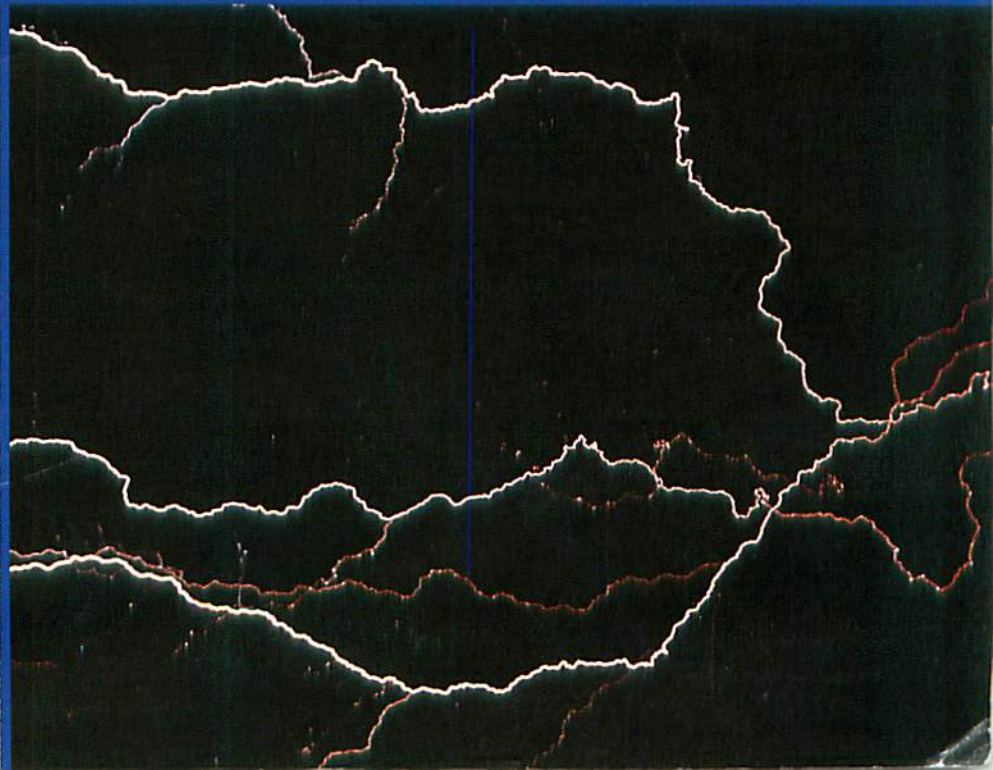
DETR
ENVIRONMENT
TRANSPORT
REGIONS

UK Climate Change Programme

Consultation paper





Foreword

The world's scientists tell us that man-made climate change is one of the greatest environmental threats we face today. They are warning us that global temperatures will increase, sea levels will rise, and droughts, floods and storms will become more frequent and severe. There is mounting evidence that they are right. 1998 is set to be the warmest year on record, surpassing the previous record which was set only last year.

The social and economic consequences of such changes could be huge. It could affect food supplies, human health, and even the future of some small island states. The well-publicised impact of the recent El Nino, the largest on record, has underlined how vulnerable we all are, even to small changes in the world's climate. For some, the effects could be catastrophic.

This Government, more than any before, has taken measures to protect our environment: to achieve better air quality; cut back on water leakage; reduce pollution at sea; and conserve energy. And we have set in place political structures to bring the environment closer to the heart of decision making.

This Government recognises a responsibility to future generations: to ensure that climate change does not reduce our children's quality of life. The Kyoto Protocol, agreed last December, showed there is global commitment to tackling the problem. For the first time, all developed countries have signed up to legally binding targets to reduce their emissions of the greenhouse gases which are causing climate change. I was proud to lead a UK team which played a key role in securing that agreement and, under our Presidency of the European Union earlier this year, brokered the deal that shared out the EU's 8% reduction target from Kyoto among Member States. We agreed to reduce our emissions to 12.5% below 1990 levels over the period 2008-2012 – a tougher target than that offered by the previous Government.

Achieving this target must be our priority. But this Government is prepared to do more. We set ourselves the objective in our manifesto of a 20% reduction in carbon dioxide emissions by 2010. This is a challenging target, but we are convinced that aiming for it could bring real improvements to our quality of life, as well as new business opportunities for UK firms. The changes set out in this consultation paper can bring gain not pain: better insulated homes; a more fuel-efficient and competitive industry; a better public transport system; and business opportunities in the important global environmental technology market.

This consultation paper is designed to stimulate a national debate on how we might meet our targets. We are one of the first countries to publish such detailed ideas since Kyoto. We are inviting views at this early stage to ensure that we have a good understanding of what can be achieved practically and cost-effectively. We are determined to meet our targets in ways which enhance rather than damage UK competitiveness, and which increase social inclusion. We also want to hear about any more imaginative and longer term ideas. We know that we do not have all the answers. Solutions will require partnerships between Government, industry, voluntary groups and individuals.

After this consultation is complete, we will develop and consult further on a new climate change programme for the UK. Above all, we want to create real commitment across the UK to tackling climate change. Climate change is a threat to us all and to our children. But it is also an opportunity to change society for the better. We must now deliver on our promises.

Overview

1. Climate change is recognised as one of the greatest environmental threats facing the world today. It threatens to have a major, adverse impact on the natural world and human society. The Intergovernmental Panel on Climate Change, representing the vast majority of scientists internationally, predicts that if no action were taken to limit greenhouse gas emissions, temperatures would rise in the range of 1-3.5°C by the end of the next century. This would be a faster rate of warming than at any time since the end of the last ice age, 10,000 years ago.

2. The whole pattern of the world's weather could change, increasing the frequency and intensity of heatwaves, floods, droughts and storms. Sea levels will also rise by between 15 and 95 centimetres. Many low lying coastal areas, often heavily populated, will be lost to the sea. Such changes to the climate threaten agriculture and water resources and raise the spectre of spreading diseases. Economic costs could be significant, and the potential for dislocation of human societies is enormous. The natural world will also suffer as habitats are lost and more and more species face extinction.

3. We in the UK face all these risks too. Possible impacts include loss of habitats, together with vulnerable and rare species; possible increases in storm damage; increased likelihood of droughts, particularly in South East England and paradoxically a greater likelihood of severe flooding. Sea level rise will lead to loss of coastal habitats and prime agriculutural land and increase the need to protect coastal towns.

4. The international community has agreed to work together to meet the challenge of climate change. Emissions that have already accumulated in the atmosphere will have an effect on the climate, whatever we do now. But we can still avoid the worst effects of climate change if we all act now – individuals, businesses and Governments alike. We, as the UK Government, intend to take a leading role in the fight against climate change. That is why in our manifesto we set ourselves the goal of reducing carbon dioxide emissions by 20% by 2010, and why reaching agreement on a legally binding target for the Member States of the European Union was a high priority for our Presidency.

5. We believe that the UK can meet challenging emissions targets. The UK is already one of the few countries to meet the voluntary targets set in the Framework Convention agreed in Rio in 1992. Since the election we have put in place a number of major new policies aimed at further reducing emissions. But to meet the challenge more will be necessary.

6. This consultation paper takes an overview of the challenge facing the UK. It seeks to establish the consensus that needs to underpin the UK's approach. It explains the nature of the commitments undertaken last December in Kyoto. It describes the framework of central government policy within which the UK reduction targets will be met; discusses our assessment of the task ahead; considers a wide range of policy options that could be used to deliver emission reductions; and provides a first assessment of the costs, benefits and practicality of potential savings in emissions. It seeks views on the best way forward.

7. After this consultation is complete we will develop more concrete proposals on how the UK might meet its targets. These will be based on thorough cost benefit analysis and build on the responses to this consultation as well as the framework provided by the related policy reviews. We will then consult on our draft programme, taking account of the prospects for using the 'flexible mechanisms' that are currently being developed.

DETAILS OF THE KYOTO AGREEMENT

8. At the Earth Summit in Rio in 1992, the UK and other developed countries agreed a voluntary target of taking measures aimed at returning their emissions of carbon dioxide and other greenhouse gases to 1990 levels by 2000 under the Framework Convention on Climate Change. At Kyoto last December the 174 parties to the Convention considered what should be the next step. In a historic agreement a new Protocol was drawn up. This would reduce developed country emissions of a basket of the six principal man-made greenhouse gases overall to 5.2% below 1990 levels over the period 2008-2012. In contrast to 1992, this target would be a legally binding commitment.

9. The target covers a basket of six greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride), weighted for their global warming impact. The base year – against which improvements are measured – for carbon dioxide, methane and nitrous oxide is 1990. The Protocol allows for either 1990 or 1995 to be used as the base year for the other three greenhouse gases – we are using 1995 in this paper, although we invite views on which base year the UK should choose at the end of this chapter. The Protocol also gives a limited allowance for action to offset emissions through absorption of carbon dioxide by forests. *In this consultation paper all emissions will be converted to their equivalent carbon dioxide emissions measured in million tonnes of carbon, and abbreviated to MtC throughout.*

10. The Protocol permits countries to undertake commitments jointly by forming a so-called 'bubble'. Under this arrangement the Member States of the European Community agreed jointly to undertake an 8% reduction. In June, under the UK Presidency, European Environment Ministers agreed how this target would be shared out between Member States. The deal takes into account each Member State's projections for future greenhouse gas emissions, including economic growth factors and the effort required to meet the Kyoto target. The UK agreed to take on a reduction target of 12.5%.

11. The agreement at Kyoto was an important first step. Only a few developed countries (the UK being amongst them) will meet the original Convention aim of returning greenhouse gas emissions to 1990 levels by the year 2000. Most developed countries currently expect emissions to increase by the commitment period in the Protocol. There will, therefore, need to be real reductions in emissions by all developed countries if the Protocol target is to be achieved. This will be a challenging task, and similar programmes of action to that envisaged in the UK are likely to emerge in these countries. However, further cuts in emissions will need to be made over time if dangerous levels of climate change are to be prevented. The Protocol provides for the targets to be reviewed before they come into effect, allowing more demanding targets to be set for future budget periods. Developing countries will need to be more closely involved in these international efforts to cut emissions, in a way that recognises the common and differentiated responsibilities of all countries to act, the principle of equity and the need of developing countries to grow.

12. The Kyoto Protocol establishes three 'flexible mechanisms' which can contribute to achieving emissions reduction commitments – joint implementation (JI), the clean development mechanism (CDM), and international emissions trading. These mechanisms allow countries to achieve part of their legally binding commitments by action taken to reduce emissions abroad. Emissions trading enables countries which achieve greater reductions than needed to meet their target to sell the surplus to other countries. Joint implementation and the clean development mechanism allow countries with targets to receive a credit for project-based activities that reduce emissions in other developed countries. Work is continuing at international level to develop detailed rules and procedures for the operation of these mechanisms, and it is likely to take some time before the structure is finally determined.

THE CHALLENGE FOR THE UK

13. The UK's baseline of emissions for 1990 for the gases covered by the Kyoto Protocol is 216 MtC (million tonnes carbon equivalent). Under the Protocol the UK is required to reduce this to 189 MtC per annum averaged over 2008 – 2012. This is a binding requirement and must be met even under adverse conditions, meaning that we must allow a margin to cover variations from our projections. While the UK will be able to use the flexible mechanisms permitted under the Protocol, these may not necessarily be cheaper than action at home.

14. Meeting the UK's legally binding target must be our priority and will be the focus of our new climate change programme. We are, however, committed to moving beyond that. We stated in our manifesto our target to reduce emissions of carbon dioxide by 20% on 1990 levels by 2010. Consequently, this consultation paper looks at a wide range of measures and aims to start a national debate on how we can move beyond our legally binding target towards a 20% reduction in carbon dioxide emissions. The UK is not the only country to have indicated its intention to reduce greenhouse gas emissions beyond the legally binding targets. Germany, Austria and Denmark also have national targets to reduce carbon dioxide by between 20 and 25% below 1990 levels by 2005.

15. We believe that there will be opportunities for real economic advantages from early consideration of policies and action, as well as real improvements to our quality of life and that of future generations. There will also be costs. But while we are fully aware that the Kyoto commitment is a legally binding obligation which cannot be jeopardised, we will not introduce measures that would damage competitiveness, nor will we take any action that would bring unacceptable social costs.

A NATIONAL STRATEGY

16. The UK Government will continue to play a leading role in international and EU negotiations. Our legally binding target is for the UK as a whole and we will need a national programme to deliver it. Some of the policies needed to deliver the UK's climate change targets will be the responsibility of the Scottish Parliament and the Welsh and Northern Irish Assemblies; others will be reserved to the UK Government. The devolved administrations will therefore have an important contribution to make in developing and delivering a new climate change programme. Regular dialogue and close co-operation will be essential. The UK must achieve its legally binding target, and action to do so must be equitably spread across the UK. The devolution legislation therefore includes powers that could be used, if needed, to ensure that the devolved

administrations contribute equitably to the achievement of the UK's target through action in policy areas for which they are responsible.

17. A strategy to meet the UK's climate change targets must be national in every sense. The response of business, central and local government, trade unions, environmental and consumer groups, and each individual will be critical. They will all be responsible for taking decisions on a daily basis that will dictate the success of the climate change strategy.

18. These sectors have already started to respond positively to the new climate change targets and to address the opportunities and difficulties they pose. The Advisory Committee on Business and the Environment published earlier this year *Climate Change: a strategic issue for business*. The TUC have organised a seminar for trade unions to discuss the impacts and opportunities of climate change policies. Local authorities are tackling climate change under the wider banner of Local Agenda 21, and the Local Government Association has recently published a draft position statement on Energy Issues. We welcome these initiatives, but recognise we in central government also have a key role to play. Our Greening Government initiative will help to drive change. We are a large user of goods and services that result in the emission of greenhouse gases. More importantly, we set the framework within which every citizen can make a contribution. The next section summarises this framework.

19. Whilst it is not the focus of this document, the Government appreciates that many organisations in the UK will have to make strategic and often costly decisions to adapt to the direct impacts of climate change. Recognising the likely impact of these effects, the Government has established the UK Climate Impacts Programme at the University of Oxford to help organisations assess their vulnerability to climate change and plan appropriate adaptation strategies.[1]

THE UK POLICY FRAMEWORK

Sustainable development

20. Our approach to combating man-made climate change is within the overall framework of sustainable development. *Opportunities for Change* set out our vision of sustainable development and aimed to start a debate on this approach. Follow up documents – including those exploring the application of these principles for waste management, business and chemicals – have now been issued. Local Agenda 21 follows through these commitments at local government level, and forms an important route for the UK to meet its climate change targets. A revised UK *Sustainable Development Strategy* is planned for early 1999.

Transport

21. Greenhouse gas emissions from transport have been the fastest growing of any sector in recent years. Our White Paper, *A New Deal for Transport: better for everyone*, is the result of a fundamental review of transport policy[2]. It recognises that the forecast levels of traffic

1 Further information is available from UK Climate Impacts Programme
Tel: 01865 281192
Fax: 01865 281188
Email: ukcip@ecu.ox.ac.uk

2 A complementary White Paper for Scotland, entitled *Travel Choices for Scotland*, and a statement for Wales *Transporting Wales Into the Future* were published alongside the UK White Paper. A Northern Ireland statement *Moving Forward* is also to be published.

incorporated in the UK's previous climate change programme have unacceptable environmental, economic and social consequences. The White Paper set out a wide-ranging package of policies to integrate transport at various levels:

- with and between different kinds of transport, so that each contributes its full potential and people can move freely between them;
- with the environment, so that our transport choices support a better environment;
- with land use planning at national, regional and local level, so that transport and planning work together to support more sustainable travel choices and reduce the need to travel;
- with policies for education, health and wealth creation, so that transport helps to make a fairer, more inclusive society.

22. These policies all aim to provide people with alternatives to the car for as many journeys as possible, whether it be through more attractive and reliable public transport, or by making walking and cycling safer.

23. The key measures in the *New Deal* have the potential to reduce road traffic carbon dioxide emissions to a level 22-27% below the current published UK forecast for 2010[3]. Other measures which are less easy to quantify could potentially add to this total (these are discussed in more detail in the *Transport* chapter).

Energy

24. Our White Paper on the *Conclusions of the Review of Energy Sources for Power Generation* set out our policy for the development of the electricity supply sector. We inherited a situation which had exaggerated the advantages of gas-fired plant, and which took little concern of the need for security and diversity of supply. As a consequence changes in the fuel mix for electricity made a disproportionate contribution to meeting the 2000 target, relieving pressure from other sectors such as transport to reduce emissions.

25. A key part of our agenda is to encourage the development of combined heat and power, which has significant environmental and other advantages, as well as substantially reducing user's costs. We have made special provisions for combined heat and power plant, alongside the stricter policy on other gas-fired plant introduced following the *Review of Energy Sources for Power Generation*, because of the environmental and other benefits of combined heat and power.

26. We are also reviewing the role of new and renewable energy policy. The review is considering what would be necessary and practicable to achieve 10% of the UK's electricity needs from renewables by the year 2010. The outcome of the review is expected later this year. We have also reviewed the role of utility regulation and published our conclusions in the light of the consultation on *A Fair Deal for Consumers*.

The 1997 and 1998 Budgets

27. In the 1997 Budget we announced a number of measures relevant to the UK's climate change strategy. We increased the levels of average annual increases in road fuel duty to 6% in real

3 Includes effect of the new National Road Traffic Forecasts.

terms, announced our intention to raise the landfill tax, and cut VAT on domestic fuel and power because of its unacceptable social impact. All these measures affect the UK's emissions baseline. In the last Budget we announced that we had asked Lord Marshall to consider whether economic instruments might be used to improve business' use of energy. The Government Task Force on the Industrial Use of Energy, led by Lord Marshall, published a consultation paper in June focusing on the leading options of an emissions trading scheme and a tax. Lord Marshall is due to report to the Chancellor by early November.

European Union policy

28. A number of the important elements of the policy framework are set at the European level. As well as sharing out the European Union's 8% legally binding target from Kyoto (with the UK taking on a target reduction of 12.5%), the June Environment Council agreed a list of priority areas for European level measures to help Member States deliver their targets. These covered issues as wide ranging as energy efficiency agreements, renewable energy policy, aviation fuel taxation, and a strategy for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. It was agreed that early and substantial progress on these measures was essential.

Developing a new climate change strategy

29. We will be seeking to establish a balanced and equitable climate change strategy. We want to look broadly at the practicality, cost effectiveness , and distributional implications of individual measures, taking into account the full range of economic, environmental and social costs and benefits of various options. Too much of the debate on climate change has focused on the cost of taking action. In contrast, we recognise the scope for economic benefits and improvements to our quality of life. Measures to tackle climate change will give us a more efficient, less car dependent transport system; better air quality; warmer, more comfortable homes; energy savings for business and consumers; and new jobs and market opportunities from more efficient technologies.

30. The investment required will be considerable – hundreds of millions of pounds per year in industry alone, compared with total industrial investment of around £10 billion per year. There will also be major opportunities for all sectors involved in manufacturing and installing plant and equipment. This should help UK businesses to build a platform from which to exploit the world markets that will develop as other countries tackle climate change. In addition, improvements in industrial energy efficiency will lead to improved product quality and greater productivity in many sectors. We will not, however, take action that would damage UK competitiveness.

THIS CONSULTATION

31. The following sectoral analyses set out in detail our estimate of the potential savings different policies could achieve in the individual sectors over the next decade. Our baseline projections are summarised in the table below. These are based on those published in the 1995 UK Climate Change programme, adjusted to take account of policies introduced since the election and the 1997 National Road Traffic Forecasts. We are currently working on a revision of projections of energy demand to reflect other developments, including the recent conclusions of the *Review of Fuel Sources for Power Generation*, and expect to publish these shortly.

32. For this consultation, we have used 1995 rather than 1990 as the baseline for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. The 1990 figures are slightly lower than those for 1995 – emissions of hydrofluorocarbons were 3.45 MtC, perfluorocarbons were 0.57 MtC and sulphur hexafluoride was 0.16 MtC – mainly because these gases have increasingly been used to replace ozone depleting substances.

	1990 (MtC equiv)	2000 (MtC equiv)	2010 (MtC equiv)
Carbon dioxide	168	157	163
Methane	25	19	16
Nitrous Oxide	18	11	12
Hydrofluorocarbons	4.2 *	1.2	1.6
Perfluorocarbons	0.2 *	0.1	0.2
Sulphur hexafluoride	0.2 *	0.3	0.3
Total greenhouse gas emissions	216	189	194

* 1995 base year used for HFCs, PFCs and SF_6

33. When we draw up our programme to meet the legally binding commitment we will need to consider a number of 'worst case' scenarios – where a combination of factors lead to significantly higher emissions than those projected. These will need to take into account, for example, wider than anticipated price differentials between different types of fuel or of economic growth increasing more than anticipated.

34. For these reasons, the following sections explore a large number of policy options that could reduce greenhouse gas emissions and deliver the carbon savings the UK needs to achieve its targets. The wide range of possible measures gives us considerable flexibility for developing a new climate change programme. We are therefore keen to consult on both these particular options and the overall shape and balance of the programme. Some policy options are well tried, and their costs and benefits straightforward to assess. Others have significant uncertainties attached to them. In all cases, we would be interested in your views on whether our assessment of the costs and savings that these policies might bring seems right. We would also welcome views on the distributional impact of different options. Where we have estimates of the level of costs and savings the measures might bring, we have included them. The following is a summary of the level of carbon savings the quantified measures in the sectoral analyses could deliver.

Sector	Projections including planned policies and actions for 2010 (MtC)	Possible measures[4] (Savings in MtC)	Further possible measures[5] (Savings in MtC)
Energy sector[6]	59	0	5
Business	75	3	7
Transport	42	4	2
Domestic	41	3	4
Agriculture, forestry and land use	22	0.5	0[7]
Public	9.4	0.5	0.6
Total	194	11	18
Change from 1990 levels (6-gas basket)	-10%[8]	-15%	-24%
Change from 1990 levels (CO_2 only)	-3%	-9%	-20%

35. Detailed questions follow each chapter. We would also welcome views on the generic questions below:

- What lessons have been learned in meeting the UK's current commitment for the year 2000? How should the approach differ given that the new commitments will be legally binding?
- Should the UK use 1990 or 1995 as its base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride?
- Is the assessment of the task ahead for the UK broadly right?
- What impact is the availability of flexible mechanisms under the Kyoto Protocol likely to have on implementing the UK target?

NEXT STEPS

36. This consultation paper is only the start of a process. We want it to initiate a national debate on how best we can meet our targets. Clearly, we in Government have a vital role to play in delivering them, and we will be required to draw up the national programme under the Protocol. But there are also vital roles for every organisation and citizen. We are particularly keen to learn of new approaches and better assessments of costs and benefits. After this consultation is complete we will develop more concrete proposals on how the UK might meet its targets and consult on our draft programme.

4 Made up of planned and lower-cost measures.

5 Made up of higher cost measures, where information is available.

6 This includes 54.3MtC carbon dioxide emissions that are also included in the table under the sector that is the end-user of the energy supplied.

7 Does not show estimated savings of 0.25-1.1. MtC from the development of short rotation coppice as a renewable fuel since these are included in the Energy Sector figures.

8 These figures take account of the new National Road Traffic Forecasts which imply a reduction of total emissions of up to about 3%.

RESPONSES

37. Comments on this consultation paper should be sent to one of the addresses below by 12 February 1999. Please note that we reserve the right to make responses publicly available unless you clearly ask us not to.

Consultees in England and Wales:

Global Atmosphere Division
3/A2
Ashdown House
123 Victoria Street
London SW1E 6DE

Or by e-mail to: climate@globatmo.demon.co.uk

Consultees in Scotland:

Climate Change Team
AEFD Environment Group
Area 1H-98A
Scottish Office
Victoria Quay
Edinburgh EH6 6QQ

Or by e-mail to: kathleen.mcaulay@scotland.gov.uk

Consultees in Northern Ireland:

J R Lightbody
Department of the Environment (NI)
Environmental Policy Division
River House
48 High Street
Belfast BT1 2DR

Energy Supply Industry

38. For the purposes of this consultation the emissions of the energy supply sector are taken as those incurred in the production of fuel for final consumption by other sectors. This includes electricity generation, oil production and refining, gas production and transmission and production of coal and other solid fuels. Carbon dioxide emissions from the energy supply industry are dealt with separately here, although they are also incorporated into the total figures for emissions by end users in the business, domestic, agricultural and public sectors.

GREENHOUSE GAS BASELINE

39. The baseline figures for 1990 for the energy supply sector are consistent with the UK's Second Report to the UN Framework Convention on Climate Change.

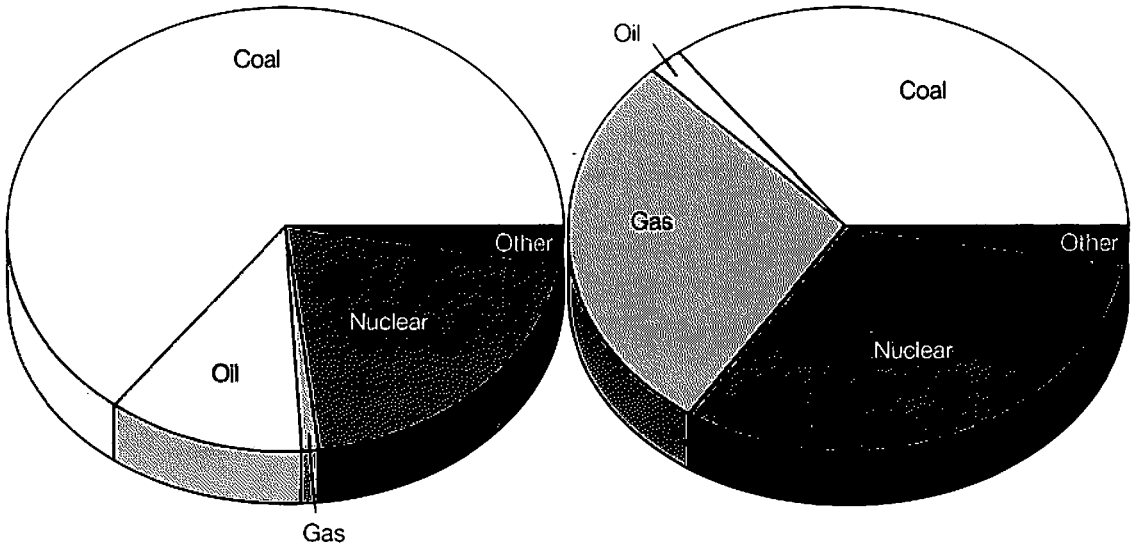
Sector	Sector (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	63	168	Fuel combustion
Methane	7.6	25	Off shore oil and gas production, coal mining, gas distribution
Nitrous oxide	1	18	Refineries
Hydrofluorocarbons	0	4.2	
Perfluorocarbons	0	0.2	
Sulphur hexafluoride	0.03	0.2	Electrical switching gear
Total	72	216	

Base year is 1995 for HFCs, PFCs, and SF_6

PROGRESS TO 2000

40. Primary energy use rose by about 6% between 1990 and 1997, and is expected to be 10% higher than 1990 levels in 2000. Over the same period, carbon dioxide emissions from the energy supply industry have fallen by about 14%, from about 63 MtC in 1990 to about 54 MtC in 1996. This is largely the result of increased efficiency in the generation process and changes in the fuel mix – largely the significant increase in gas-fired generating capacity. Emissions from the electricity supply industry alone have fallen by some 20% – from 54 MtC in 1990 to 43 MtC in 1996 and around 40 MtC in 1997.

Changes in fuel mix between 1990 and 1997



41. The change in fuel mix represents a transformation in the way electricity is generated in the UK. There has been a significant shift away from more carbon-intensive fuels, such as coal and oil, which produce high levels of greenhouse gas emissions, towards lower or zero emission fuels, such as gas and nuclear energy. More efficient technologies, such as combined cycle gas turbine and combined heat and power have also been taken up, and helped to reduce power station emissions.

42. Methane emissions from oil, gas and coal production which represented 30% of total UK methane emissions in 1990 will have fallen by between 40% and 50% by 2000. Emissions from coal production have fallen, largely due to declining production, although there have also been initiatives to monitor and utilise methane extracted from mines. Fugitive emissions from storage and losses from the gas distribution network have also declined through pipe replacement and leakage control initiatives.

43. Forecast emissions for 2000, compared to the 1990 baseline, are set out in the table below.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	63	50
Methane	7.6	4.1
Nitrous oxide	1	0.9
Hydrofluorocarbons	0	0
Perfluorocarbons	0	0
Sulphur hexafluoride	0.03	0.04
Total	72	55

Base year is 1995 for HFCs, PFCs, and SF_6

PLANNED POLICIES AND ACTION FOR 2008-2012

44. We have published the conclusions of our review of *Energy Sources for Power Generation*. The policies of the last Government led to a rapid shift from coal to gas-fired generation. Although this shift produced major cuts in emissions, we need to address the underlying market distortions to ensure diversity and security of supply are protected. We are not prescribing which fuels should be used for electricity generation. We want to create a competitive market, based on diverse fuel sources, with lower energy costs for consumers. Until market distortions have been removed we will apply a stricter policy on power station consents.

45. There will be no artificial support for carbon intensive fuels, such as coal, and our proposals remain consistent with a continued decline in carbon emissions from the electricity generating industry. Further growth of generation from lower or zero carbon sources is still likely and will reduce emissions. There are a number of gas-fired power station projects which have all the necessary consents but which are not yet in production. We have made clear that high efficiency combined heat and power projects will be regarded as outweighing the concern over new gas-fired generation. Other applications for consents that are consistent with environmental objectives, such as generation from cleaner coal and renewable energy projects, are likely to be within the scope of our energy policy.

46. Our policy proposals to remove the distortions identified in the electricity market should mean that over the next few years the scale of displacement of coal by gas is likely to be somewhat less than would otherwise have been the case. However, for the reasons given above, they are consistent with a continued decline in carbon emissions from the electricity supply industry towards our climate change targets.

47. Our baseline projections indicate that total UK coal demand (including coal for coke manufacture) could be in the region of 50 million tonnes in 2010. For comparison, UK coal consumption was about 108 million tonnes in 1990 and 63 million tonnes in 1997. These projections included scenarios in which new coal fired capacity was constructed beyond 2005, although this now seems less likely to occur. As noted above, new projections will be published shortly; these will take account of all recent developments, including the conclusions of the *Review of Energy Sources for Power Generation*.

Nuclear

48. Nuclear power currently contributes significantly to the UK's electricity and plays an important part in helping the UK to meet its climate change targets. In 1996/97, if the nuclear electricity output had been generated by coal or combined cycle gas turbines, carbon dioxide emissions would have been about 20 or 10 MtC respectively higher. Nuclear availability is expected to remain high over this period. We believe that existing nuclear power stations should continue to contribute to UK emission reductions, provided that high standards of safety and environmental protection are maintained. However, other environmental and economic factors need to be taken into account when considering a longer term role for nuclear energy.

49. In the longer term electricity generation is likely to become more carbon intensive as the contribution from nuclear energy declines. Development of other low and zero carbon energy sources, such as renewables, will therefore be essential for meeting tighter climate change targets in future commitment periods.

Renewables

50. Existing policies have also stimulated the development of renewables in the energy market. With support from the Non-Fossil Fuel Obligation and the Scottish Renewables Orders, renewables suppliers have had the certainty of long term contracts and prices have fallen to a level where for some technologies they are, or are nearly, cost-competitive with traditional fuel sources. New renewables are expected to have a generating capacity of about 1500 megawatts by 2002/03, on top of 1400 megawatts of existing large scale hydro power, meeting around 3% of UK electricity demand, and delivering savings of about 2 MtC on 1990 emission levels. This is useful progress but more is needed.

Increasing plant efficiency and use of combined heat and power

51. There is some scope for further improvements in the efficiency of the industry, for example by increasing the use of combined heat and power technology. Combined heat and power can provide a secure and highly efficient method of generating electricity and heat for local use. It significantly reduces primary energy use, energy costs and emissions. In current installations, savings can be generated of about 30% when compared to coal fired plant and 10% against combined cycle gas turbine. On new installations, efficiencies of about 70% are common and 80% or more are achievable.

52. Our current target is to achieve 5000 megawatts of installed combined heat and power capacity. This objective is under review. In order to achieve wider installation of combined heat and power, we have been promoting its wider use and working to remove barriers to take-up. We aim to support possible schemes at every stage, with site-specific advice, case studies of good practice, and financial support from the Energy Saving Trust and business. However, if present trends continue, many cost-effective opportunities for combined heat and power will still not be taken up.

53. Implementation of Integrated Pollution Prevention and Control (IPPC) (see *Business* chapter paragraphs 81 and 101) will drive further efficiency improvements in the electricity supply industry. Savings from this source are, however, likely to be small as it is already in the interests of the industry to improve the fuel efficiency of generation.

Utility regulation

54. *A Fair Deal for Consumers* recognised that the economic regulation of the utilities has a contribution to make towards the delivery of environmental objectives. We have confirmed that Ministers should issue guidance on social and environmental objectives, including energy efficiency objectives, to the regulators; and that the regulators will be placed under a duty to have regard to the guidance in the exercise of their functions. This should stimulate further improvements in energy efficiency. We also agreed that further measures, which would have significant financial implications for consumers or the regulated companies, should be brought in by specific legislation rather than being a matter of guidance and at the regulator's discretion.

Fugitive methane emissions

55. Total methane emissions from the energy supply industry are forecast to continue to fall as a result of industry's initiatives to limit fugitive and other emissions from coal, oil and gas production and distribution. Implementation of IPPC will also impact on emissions from the oil refining industry.

56. Forecast emissions for 2010 are set out below, alongside emissions from the baseline year of 1990.

	1990 (MtC equivalent)	2010 (MtC equivalent)
Carbon dioxide	63	54
Methane	7.6	3.3
Nitrous oxide	1	1.2
Hydrofluorocarbons	0	0
Perfluorocarbons	0	0
Sulphur hexafluoride	0.03	0.05
Total	72	59

Base year is 1995 for HFCs, PFCs, and SF_6

POSSIBLE FURTHER POLICIES

Renewables

57. We are committed to a new and strong drive for renewable energy. Our review of renewable energy policy has been looking at what would be necessary and practicable to deliver 10% of UK electricity demand from renewables by 2010. The review will canvass a number of options for the development of renewables. It addresses both the medium term to 2010 and the longer term potential for home and export markets. It considers using existing mechanisms such as the Non-Fossil Fuel Obligation (NFFO) and central government support programmes. We will also take into account any recommendations made by Lord Marshall which are relevant to this area. It considers all technologies thought to be relevant to the UK in home or overseas markets, including those that could contribute significantly to meeting 2010 targets and those for the longer term. It addresses electricity and heat markets.

58. We have announced the composition of the 5th Renewables Order in England and Wales (NFFO 5) and the 3rd Renewables Order in Scotland (SRO 3). Such orders are designed to secure additional generating capacity and represent the first step in our new and strong drive to develop new renewable energy sources. NFFO 5 includes landfill gas, energy from waste (including a number of schemes using combined heat and power), small scale hydro and onshore wind energy. We intend that SRO 3 should also include wave and biomass.

59. A 10% target for electricity from renewables would require a series of issues to be addressed including, for example, obtaining planning permission for projects, and introducing on a significant scale newer technologies such as offshore wind and energy crops (covered in more detail in the *Agriculture* section). Our review also considers the need for further research and development into technologies such as fuel cells and photovoltaics which are not yet commercially viable for wide scale application. We expect to announce our proposals later this year.

60. Delivering a 10% contribution to electricity supplies from renewables could deliver further carbon savings of up to 5.4 MtC in 2010 in addition to those expected to be realised from NFFO arrangements already in train. The level of carbon savings achievable will depend on how practical difficulties, such as obtaining planning permission for projects and support for energy crops, are handled.

61. A major objective of our renewables strategy is to assist renewable energy technologies to become competitive. Prices for contracted projects have fallen significantly under successive NFFO rounds. Projects under the first two NFFO Orders will be operating from the end of 1998 without NFFO subsidy, while some technologies in the later Orders are competing on near cost-competitive terms.

62. We will work with renewable energy generators to encourage them to take advantage of the liberalised market and to take up the opportunity for 'green electricity' trading. A number of companies have already entered the green electricity market or signalled that they intend to do so. We are also interested in ACBE's proposal for a new voluntary business commitment to purchasing renewable energy at market prices to give long term contract stability to suppliers, and we are keen for firms to take up this challenge.

Increasing plant efficiency and use of Combined Heat and Power

63. We are committed to promoting combined heat and power as an efficient generating technology. Research by ETSU and BRECSU indicates that the economic potential for use in industry, commerce, the public sector and community heating is in the range of 12,000-19,000 megawatts, depending on assumptions made about future energy prices, rates of return on investment and other factors. We believe the wider use of combined heat and power could achieve savings of around 6 MtC in 2010 and will set a new target as part of our new climate change programme.

64. Our *Review of Energy Sources for Power Generation* concluded that there should be a stricter consents policy for new power stations, but made a clear exception for combined heat and power plants. We recognise that such plants have environmental and other benefits which may outweigh concerns about further new gas-fired generation. This will typically be the case when combined heat and power plants are properly sized to meet on-site or nearby heat and electricity requirements and deliver high levels of efficiency.

65. We are identifying other measures that will be needed to achieve higher rates of combined heat and power installation. Some of these, such as implementation of the Integrated Pollution Prevention and Control Directive, are discussed in the *Business* chapter. In addition, the impact of the new electricity trading arrangements and other reforms of the electricity market and regulatory system must be considered.

Utility Regulation

66. As discussed in the *Domestic* chapter, a new energy efficiency Standards of Performance scheme is one possible means through which further energy and carbon savings could be promoted in the domestic and small business sectors. In line with the conclusions of the review of utility regulation, it would fall into the category of measures which should be implemented through new specific legal provision rather than relying on guidance to the regulator.

Energy Services

68. One means by which energy suppliers could seek to encourage energy efficiency would be by offering energy services packages to their customers. Such packages could include energy efficiency measures alongside fuel supply. In the context of reducing energy prices we believe that this approach has considerable scope to contribute to reduced energy use and lower fuel bills. However energy service companies, whilst beginning to operate in the business sector (see paragraph 99 of *Business* chapter) have yet to emerge strongly in the domestic sector and small business sectors.

Fugitive methane emissions

69. Reductions in methane emissions have largely resulted from the decline of the coal industry and voluntary initiatives by energy companies. We plan to review the impact and effectiveness of these initiatives and consider in consultation with industry what further action might be taken and targets set.

SUMMARY

70. The main policies we in central government could use to tackle emissions from the energy supply industry are summarised in the table below, together with an illustrative level of carbon savings possible, estimated costs, and other relevant factors. The distributional implications of the policies have not been identified explicitly, but will need to be incorporated in the evaluation process. The impact of the *Review of Energy Sources for Power Generation* will be critical, as well as the proposals emerging from the renewables review.

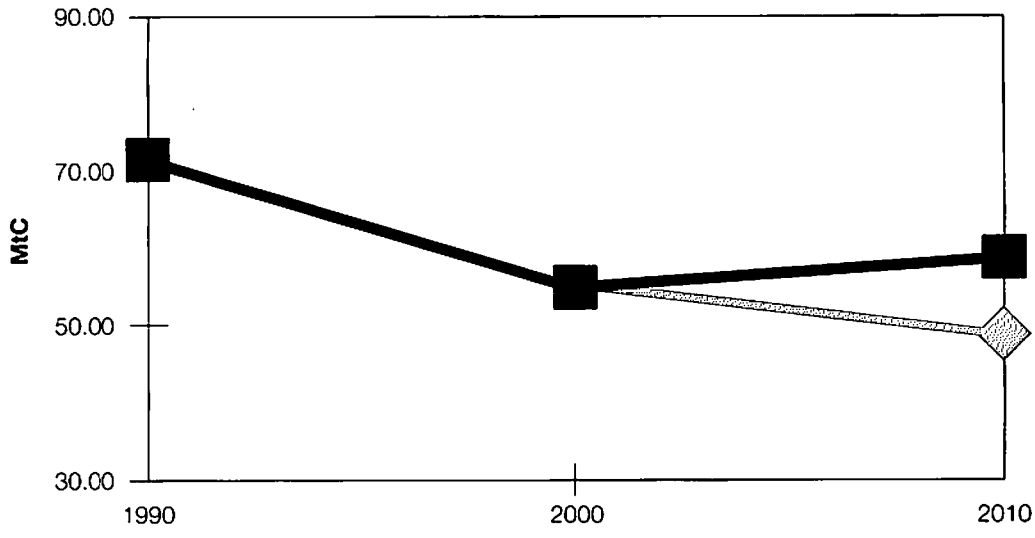
Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
New CHP target for 2010	around 6	Typically £100 benefit, but depends on sector and assumptions	Not additional to savings counted under *Business* and *Domestic* chapters
10% renewables in 2010	up to 5.4	£50-£150	Annual support cost of £300-£450 million in 2010 – could be funded by levy (as now)
IPPC implementation	Quantified in *Business* chapter		Applies to power stations, refineries and CHP in parts of the business sector

71. The table below suggests a possible classification of the available savings for the Energy Supply sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Energy Supply Industry	59	–	5.4

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.

Energy Supply Sector



Projected emission levels from the energy sector with and without possible measures.

QUESTIONS

i) How accurate are the estimates of carbon saving from the energy supply industry?

ii) How could measures to support renewables be most effectively targeted?

iii) Would business be prepared to commit to buying electricity generated from renewables?

iv) How might further reductions in fugitive methane emissions be delivered?

v) What encouragement can be given to the development of energy service companies?

vi) Given the estimated potential for combined heat and power, at what level should the new target be set, and what measures are needed to achieve it?

Business

72. For the purpose of this consultation paper the business sector is taken as including both the manufacturing and commercial sectors. The *Energy Supply Industry* chapter deals separately with that sector, and the implications of business' use of transport is covered more fully in the *Transport* chapter.

GREENHOUSE GAS BASELINE

73. The following baseline figures for the business sector are consistent with those set out in the UK's Second Report to the UN Framework Convention on Climate Change. They do not include business' transport emissions which are covered in the *Transport* chapter, but do include business' share of power station emissions (which are also covered in the *Energy Supply Industry* chapter).

	Sector (MtC equiv) (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	68	168	energy use
Methane	6.4	25	waste to landfill
Nitrous oxide	8.1	18	chemical industry
Hydrofluorocarbons	4.2	4.2	HCFC-22 manufacture and refrigerants
Perfluorocarbons	0.15	0.2	aluminium production
Sulphur hexafluoride	0.17	0.2	magnesium industry
Total	87	216	

1995 base year used for HFCs, PFCs, SF_6

PROGRESS TO 2000

74. Business' energy use rose by about 3.5% between 1990 and 1996. Over the same period, carbon dioxide emissions fell by 10% while gross domestic product increased by 9.5%.

75. Much of the reduction in emissions is the result of large scale fuel switching in electricity supply, and to a lesser extent by industry itself – the so-called 'dash for gas' – which has reduced the carbon intensity of delivered energy. This is likely to account for about 70% of the fall in industrial carbon dioxide emissions by 2000 relative to the increase in GDP. A further 10% can be attributed to changes in the UK's industrial structure.

76. Nevertheless, some 20% comes from improvements in energy efficiency. Competitive pressures will continue to drive business to improve efficiency further. Initiatives such as our Energy Efficiency Best Practice Programme have also been crucial in driving the adoption of energy efficient technologies and better energy management practices, including the use of more efficient combined heat and power technology. It is estimated that the Best Practice Programme will have stimulated savings of 3.5 MtC from business in the year 2000 and will continue to deliver savings beyond that point.

77. Forecast emissions for 2000, compared to the 1990 baseline, are set out in the table below.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	68	62
Methane	6.4	5.2
Nitrous oxide	8.1	1.4
Hydrofluorocarbons	4.2	1.0
Perfluorocarbons	0.15	0.14
Sulphur hexafluoride	0.17	0.24
Total	87	70

1995 Base year is 1995 for HFCs, PFCs, and SF_6

CURRENT POLICIES AND PLANS TO 2010

78. Forecast emissions in 2010 are set out below, alongside emissions from the base year of 1990.

	1990 (MtC equivalent)	2010 (MtC equivalent)
Carbon dioxide	68	68
Methane	6.4	3.9
Nitrous oxide	8.1	1.5
Hydrofluorocarbons	4.2	1.3
Perfluorocarbons	0.15	0.21
Sulphur hexafluoride	0.17	0.23
Total	87	75

Base year is 1995 for HFCs, PFCs, and SF_6

Carbon dioxide

79. We will continue to foster a competitive environment in the UK, which will maintain continued pressure, and provide continued support, to reduce costs and invest in new technology. We therefore expect that business' record on improving energy efficiency will continue. However, forecast trends are now upward, reflecting a period of economic growth and low energy prices, and business related carbon dioxide emissions could be approaching the 1990 level by 2010.

80. Improvements in energy efficiency have been driven by various commercial pressures – including cost, routine replacement of equipment and product modification – and stimulated by Government advice and assistance, such as the Energy Efficiency Best Practice Programme. These will continue to deliver savings beyond the year 2000. The business sector also has an important role to play in delivering the new climate change targets, which will require new measures.

81. The Integrated Pollution Prevention and Control Directive (IPPC) will be brought into force between 1999 and 2007, replacing the UK's current Integrated Pollution Control system. This group includes most small firms. Under IPPC, all qualifying sites will have to obtain an authorisation from the regulator which will set out discharge limits for all significant pollutants. They will also, for the first time, be required to use energy efficiently. It will apply to most, but not all, energy intensive industries. 60% of business' carbon dioxide emissions come from industrial firms not regulated by IPPC and from the commercial sector.

82. At present, we are considering a number of options for IPPC implementation, including an assumption within BAT[9] guidance that sites should implement all measures defined as cost effective. In the longer term, the Directive could also offer a framework for a domestic trading scheme. Our estimate is that implementation will reduce emissions by at least 0.5 MtC in 2010.

Methane

83. 25% of total UK methane emissions derive from waste management in the business sector. Overall, these emissions are projected to decline, due to improved waste management practices. We have already announced that the landfill tax will be raised to £10 per tonne of active waste from April 1999 which will encourage recycling of methane generating waste that would otherwise go to landfill. *Less waste: more value* set out a range of other policies which should reduce waste production and encourage re-use and recycling.

Nitrous oxide

84. Business is responsible for 44% of total nitrous oxide emissions, mainly as a by-product from chemical industry processes. These are forecast to decline sharply by 2000 because of the installation of emission abatement technology.

Hydrofluorocarbons

85. Emissions are anticipated to increase substantially between 1990 and 2010 although the overall global warming impact will fall by a factor of three because of likely changes in the mix of hydrofluorocarbons towards those with lower global warming potentials. In 1990, 99% of HFC emissions were produced as a by-product of HCFC-22 manufacture and these are expected to decline in response to pollution control regulation. Emissions from other sources are increasing as HFCs are used as replacements for ozone depleting substances.

Perfluorocarbons

86. Similarly, UK perfluorocarbon emissions are expected to decline by 68% from 1990 to 2000 as a result of enhanced pollution control measures mainly in the aluminium smelting industry. However, increasing use of perfluorocarbons in other sectors such as fire fighting and solvents is expected to result in emissions starting to rise again after 2010.

9 Best Available Techniques.

Sulphur hexafluoride

87. These mainly derive from the magnesium and electronics industries. Total emissions are forecast to increase by about 65% between 1990 and 2010.

POSSIBLE FURTHER POLICIES

88. It is widely recognised that business has made a significant contribution to tackling climate change by improving energy efficiency and reducing energy use over the past few decades. However, recent evidence suggests these trends may be slowing down. Emissions of greenhouse gases from the business sector are projected to continue to fall between 2000 and 2010, but this is mainly due to reductions from the electricity generation sector, with other business-related emissions forecast to rise slightly. This is inspite of the fact that studies show that there is still significant potential for firms to take measures that would be defined as cost-effective (see paragraph 91 below).

89. Government action will play a key role in influencing trends in greenhouse gas emissions from business, but business commitment to tackling climate change is critical. Business is best placed to develop new technologies and techniques to reduce emissions and thereby take advantage of the new business opportunities which will arise. Our objective is to set a policy framework which encourages business to take the action necessary to reduce emissions, while giving sufficient freedom to make its own decisions about which actions are most suitable.

90. We therefore welcome the report by our Advisory Committee on Business and the Environment (ACBE), *Climate Change: A Strategic Issue for Business*, which accepted the need for action and outlined the elements of a long term policy framework within which business could operate and deliver carbon savings cost-effectively. ACBE is confident that if business responds to the climate change challenge now it can manage and control the process in a cost-effective way, put in place long-term solutions, and maximise the gains in terms of new markets and increased competitiveness.

91. Estimates of the scope for carbon dioxide savings in business differ. It has been suggested that savings beyond "business as usual" of about 7 MtC from industry and about 3.5 MtC from commerce (including CHP as well as end-use energy efficiency) could be achieved through the introduction of measures that would be cost-effective – at a payback period of typically one to two years for retrofits and two to four years for most new plant. These headline trends mask significant variations between sectors and individual firms.

92. Approximately 2000 industrial sites are responsible for about 40% of carbon dioxide emissions from business. These tend to be relatively efficient in their use of energy, although benchmarking reveals substantial differences in performance. The remaining 60% or so of carbon dioxide emissions from business is attributable to the less energy intensive industries, to commercial sectors such as retail, banking and other services, and to small businesses.

93. Bigger carbon dioxide savings from new investment could only be achieved if we went beyond current definitions of "all cost-effective" measures. Work by ETSU suggests that as much as an extra 4-5 MtC could be saved in industry, on top of the 7 MtC or so potentially achievable cost-effectively, if 'all technically possible' measures were introduced.

A voluntary approach

94. There is scope to extend the use of voluntary agreements. The chemical industry has led the way, agreeing to cut its energy use per tonne of product to 20% below 1990 levels by 2005. ACBE saw much value in this approach and urged sectors to enter into similar agreements by the end of 1999. We welcome this approach and are willing to enter negotiations with interested sectors, provided the targets set are challenging and robust, and that transparent monitoring and reporting systems are established. Voluntary agreements can raise awareness and ensure that cost-effective efficiency savings are realised as part of the planned investment cycle. They could be useful in sectors preparing for IPPC regulation, to ensure they will be well placed to comply with regulations when they take effect. However, we recognise the limits of this approach, given that voluntary agreements will be inappropriate for large and diverse sectors and for those without strong trade associations willing to negotiate and commit to demanding targets.

95. Business also has a role to play in improving the market penetration of more efficient products and stimulating and enlarging consumer choice. Some sectors have entered into negotiated agreements to bring more efficient products on to the market ahead of mandatory performance standards. To date, these have covered lighting, as well as a number of brown and white goods, and have generally been reached at EU level. Such agreements improve savings that can be made from the domestic sector, and are covered in more detail there. We are considering extending this approach to business products in view of the scope for carbon savings from, for example, more efficient office equipment and electric motors.

Information, advice and best practice

96. Our Energy Efficiency Best Practice Programme has successfully stimulated energy efficiency improvements by providing impartial, authoritative information and advice. Maintenance of such high quality information will maximise the impact of other measures by helping firms to optimise their energy efficiency investments.

97. We are committed to the promotion of combined heat and power (CHP) as a key element of a climate change strategy. This is discussed in more detail in the *Energy Supply* chapter. We estimate that the potential for industrial CHP accounts for at least half the 7MtC savings estimated as achievable in Industry under the "all cost-effective" scenario.

98. We believe all large businesses should report publicly on environmental performance and should set their own targets for improvement. This could include emissions of key greenhouse gases, based on the work developed by the United Nations Environment Programme. Our paper *Business and Sustainable Development* sought views on a range of business-related sustainable development issues, including the use of a core set of environmental indicators, and asked whether reporting against these should be made mandatory. Business can do much to enhance its performance by exerting influence in the market through the supply chain. It can also stimulate change by communicating effectively with its various stakeholders – customers, suppliers, shareholders, employees, regulators and neighbours.

99. In the competitive energy market, suppliers have increased flexibility to evolve into energy service companies which would sell services rather than just units of electricity or gas. A few companies already offer these services, but are focusing on large, energy intensive firms. They offer savings through investment in demand side management. The development of more sophisticated meters will allow time of use charging and other market innovations which should make them increasingly attractive to business.

100. Business should also consider the possibility of entering into dialogue with its key stakeholders as a means of identifying where emission savings might best be made. Further discussion of this approach is available in the UK Round Table on Sustainable Development's report on *A Stakeholder Approach*.

Regulation

101. As discussed in paragraph 81, the IPPC Directive will be brought into force between 1999 and 2007, replacing the UK's current Integrated Pollution Control system, and this now include an energy efficiency requirement. We estimate that this will save at the minimum 0.5 MtC in 2010, but this is a fairly pessimistic assumption. If we were to ensure that the requirement will mean qualifying sites implement all cost-effective measures to use energy efficiently, this measure alone could reduce emissions by as much as 3 MtC in 2010.

102. The energy efficiency requirements of the Building Regulations are currently under review. Consideration is being given to extending the scope of the energy efficiency requirements: requiring some measures to be more stringent than at present; covering buildings' contribution more comprehensively (for example, including air conditioning); and applying the regulations to existing stock. In Scotland, a comprehensive review of Part J of the Technical Standards is also planned to assess the scope for changes that would deliver carbon dioxide reductions.

Fiscal measures

103. The vast majority of firms in the UK will not be covered by either IPPC or voluntary agreements. Economic instruments potentially provide a flexible, dynamic and cost-effective way of improving energy efficiency and delivering emissions reductions. ACBE, for example, recently concluded that a carefully designed tax on the carbon content of energy could help over the longer term to encourage a different approach to fossil fuel use. The potential for, and the scope and design of, a tax affecting business' energy use is one of the issues under consideration by Lord Marshall, alongside a system of tradeable permits. We would clearly need to consider other issues, including compliance and administration costs, and the effects on sectoral competitiveness.

Emissions trading

104. The Kyoto Protocol provides for the establishment of an international emissions trading regime. Firms as well as governments may be able to participate in these mechanisms – potentially offering firms a cost-effective means to reduce emissions. The rules for such a scheme will start to be developed at the Conference of the Parties in November 1998, but are unlikely to be completed before 2000. We believe that there may be benefits in a domestic trading scheme to deliver carbon savings cost-effectively in the UK; this is one of the options under review by the Marshall Task Force.

105. A domestic trading scheme gives firms legally binding targets to reduce emissions. Firms are free to achieve greater savings than their target requires and sell the 'surplus' to others finding it more difficult or expensive to meet their target. Firms might also be able to use credits from emission reduction projects in other firms or in the local community to meet part of their target. The end result should be a more efficient pattern of emissions reduction across the sector, as savings are achieved where it is most cost-effective to do so. If the practical issues of design could be overcome quickly enough, such a scheme could come into force in advance of any future international regime, giving UK firms experience of trading, and could give them first mover advantages – including establishing the City of London as a centre for trading – when the international scheme was launched.

106. The UK is committed to helping to develop a practical international trading scheme – ensuring that it combines economic efficiency and environmental effectiveness and encourages firms to participate. For firms to benefit from the flexibility offered by the international system, any domestic scheme would need to be compatible with it. This would include allowing firms participating in a domestic trading scheme to use credits from joint implementation or clean development mechanism projects abroad to help meet their domestic targets.

107. The design of any domestic trading scheme would need careful thought, since any trading scheme requires binding targets to be set for participants. Some of the issues that would need to be resolved are set out below. These do not extend to the many more detailed questions of implementation.

- Should the scheme be limited to carbon dioxide or cover all six gases in the Kyoto basket?
- How should any permits or emissions targets be allocated?
- How extensive should the scheme be – confined to major energy users and/or energy supply industry, or allowing a wider 'opt in'?
- How can the system best encourage participation by UK firms in the international flexible mechanisms?

108. These detailed questions were raised in Lord Marshall's consultation document. A generic question for this consultation paper is set out at the end of the chapter.

Commercial buildings

109. Buildings are an integral part of business activities, and a more sustainable approach to their design, construction, operation and refurbishment could result in substantial savings in carbon dioxide emissions. Energy used in the operation of buildings themselves, excluding processes carried on in them, accounts for between 40% and 50% of the UK's present emissions of carbon dioxide. Commercial and industrial buildings account for half of this.

110. We recently consulted on energy efficiency of buildings in the context of sustainable development, posing specific questions in the Construction sectoral document in the *Opportunities for Change* series. We are also consulting on the energy efficiency requirements of the Building Regulations. The responses to these two documents will help in the development of an agenda for action to improve building performance. This agenda, backed by appropriate indicators, will influence both the procurement of new commercial and industrial buildings and the management and refurbishment of the existing stock. The technology and techniques exist to apply cost-effective energy efficiency measures widely through the building stock, and have the potential to save 20-30% of current building-related emissions. But such reductions will require substantial market transformation.

111. Recognising the uncertainties about the pattern of carbon dioxide emissions and energy use in commercial buildings, we have been sponsoring the development of a non-domestic buildings model. A technical fact file with full contact details was published earlier this year.[10]

10 Non-domestic building energy fact file. Published on behalf of BRE by Construction Research Communications (0171-505-6622).

Small and Medium Enterprises

112. There are over 3.5 million small and medium sized enterprises in the UK, and all but 25,000 of these have less than 50 employees. Research shows that most small and medium enterprises are unlikely to have dedicated resources or technical expertise in energy or environmental management. They are also unlikely to be covered by existing regulation, and often face a disproportionate burden if brought within a detailed regulatory system. Where energy costs account for a small proportion of total overheads, opportunities to make savings through energy efficiency measures may be given little attention.

113. But as a relatively energy inefficient group, there are likely to be significant cost-effective savings to be made in small and medium sized enterprises. We therefore consider that a more targeted approach should be developed. Our analysis of achievable savings from small and medium sized firms suggests potential savings in the range of 0.5-1 MtC per annum in 2010 in addition to the savings which would be made if business continued as usual. These measures would be cost-effective for the sector, but the most appropriate and cost-effective delivery mechanisms would need to be carefully considered. Mechanisms might include, for example, innovative financial approaches (such as a revolving loan fund[11]); the development of energy services; or schemes that involve larger businesses or the energy supply industry in improving the energy efficiency of small and medium sized firms (for example through a standards of performance programme – see paragraph 180). Lord Marshall's work on economic instruments has also looked at what the special circumstances of the small and medium sized business sector would mean for the design of tax or trading schemes.

114. Some of the assumptions made in arriving at the estimates of savings and costs for small firms, although grounded in past experience, are necessarily more in the nature of hypotheses. In light of the significant uncertainties involved, we have used large ranges of estimates. Assumptions include:

- that payback on measures would need to be reduced to around one year (from the more usual two years on retrofit/'add on' measures or four years for new plant on replacement) to attract sufficient uptake;
- that response rates are likely to vary widely across different sizes of enterprise;
- that the overheads associated with 'selling' energy efficiency to small and medium enterprises will be substantial.

115. We would be grateful for consultees' views on these assumptions.

Other options

116. We are also considering a number of other options for delivering carbon savings, particularly from greenhouse gases other than carbon dioxide:

- We are working with the European Commission to develop and implement a framework for limiting and/or reducing emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (see also *Transport* and *Domestic* sectors). Member States have agreed that this could cover issues such as improved emissions monitoring; measures to reduce leakage;

11 for example the Northern Ireland Small Business Loan Fund run by the Energy Saving Trust

life-cycle management and recycling; reduced usage by efficiency improvements to cooling, heating and air-conditioning equipment; and options for replacement by other substances.

- Agreements with manufacturers and key users of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride – we are revisiting the existing agreements with key users of hydrofluorocarbons and are considering extending this approach to other gases. Key features might include leakage reduction targets and codes of practice.

- We are considering the scope for action to tighten up product standards to limit hydrofluorocarbon emissions to the atmosphere and to encourage the greater use of acceptable alternatives. Options would include registration and training of users and limiting the use of hydrofluorocarbons to where they are essential as replacements for ozone depleting substances.

- Control on the emissions of sulphur hexafluoride – we are evaluating the effectiveness of current local air pollution controls of sulphur hexafluoride and will consider the scope for cost-effective alternatives to its use.

A mix of policy instruments

117. The inter-relationship between the various policies – including regulations, voluntary agreements and economic instruments – needs careful consideration. For example, the IPPC Directive addresses energy efficiency in industry, and the obligations that arise from that would need to be taken into account when setting targets for industry in a trading scheme. Different sectors of industry may require a different mix of instruments, but the need to maintain equity between different industrial sectors will be a key consideration.

118. But for many other firms, the inter-relation of different policies will not be an issue. Indeed most firms are not intensive users of energy and will not face regulatory pressure from IPPC. For non-energy intensive firms, including firms in the commercial sector and most small and medium sized enterprises, energy issues tend to be viewed as non-core business and a low priority for management. Energy represents a fairly small proportion of the total expenditure and the incentive to save energy and hence reduce carbon dioxide emissions is low.

SUMMARY

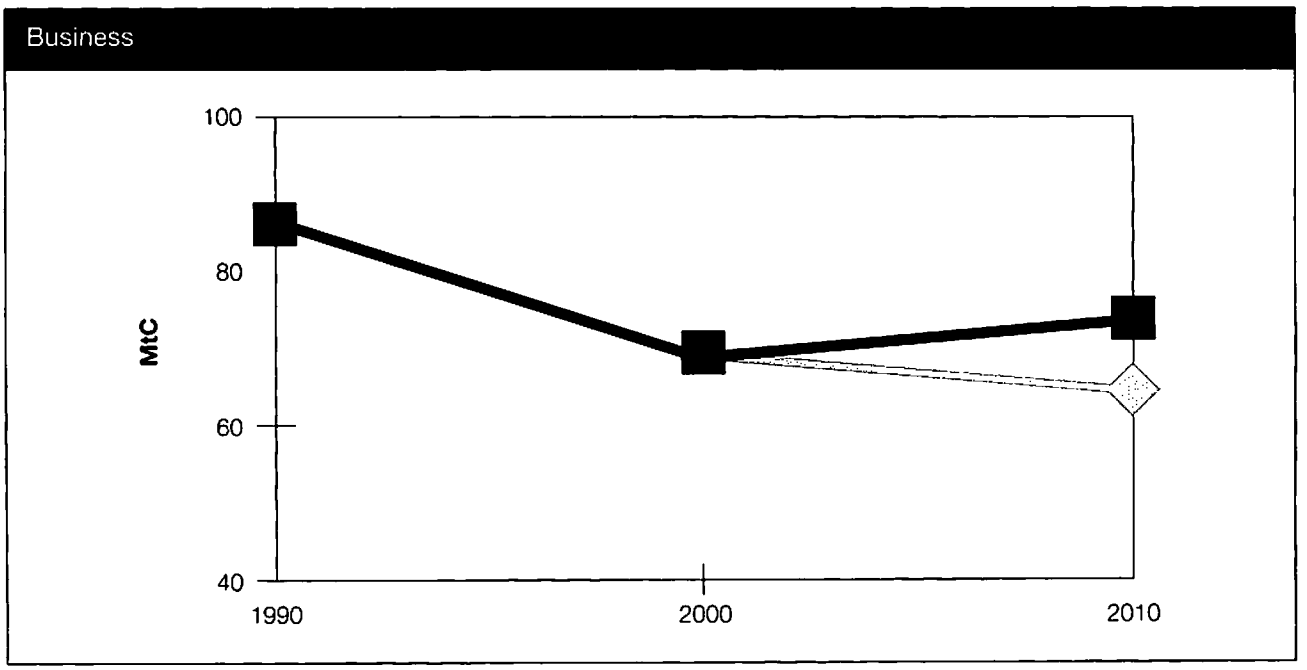
119. Work on many of the policy options listed above is still at an early stage and detailed estimates of costs and carbon savings are not available. However, the table below summarises our estimate of the scope for savings from the policies set out above.

Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
Economic instruments	Depends on design		Lord Marshall has been asked to consider fiscal measures, including an industrial energy tax and carbon trading. We await his conclusions. Design of carbon trading scheme linked to negotiations on an international carbon trading scheme.
Energy efficiency element of IPPC	up to 3	Average benefit about £30, but costs to individual firms will vary	Investment could be offset by efficiency gains
Voluntary agreements	Potential to deliver an additional 0.5-2		Cost and savings would depend on level of targets and sectoral coverage
Energy saving in small and medium sized enterprises	0.5-1	£60-80 benefit	Would require capital investment of £40-100 million annually
Other greenhouse gas limitation initiatives			Further work needed on individual measures
Building regulations	0.1-0.15		Depends on the outcome of the current review of Part L of the Building Regulations

120. The table below suggests a possible classification of the available savings for the Business sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Business	75	3	7

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.



Projected emission levels from the Business sector with and without possible measures.

QUESTIONS

i) Do you agree that significant scope for cost-effective energy savings still exists in the business sector? If so, how can we best stimulate take-up, and what barriers prevent firms taking advantage of these savings?

ii) How can central government build on business' commitment and commercial forces to improve efficiency beyond business as usual and achieve "all cost-effective" savings?

iii) Is it possible to devise policies which address both large and small firms effectively? Is it equitable to take a radically different approach for small and medium enterprises?

iv) How could the measures to stimulate energy efficiency be most effectively targeted to deliver results, particularly in the small and medium enterprise sector?

v) What supporting measures would help business make cost-effective improvements and maximise the impact of any regulatory or economic measures?

vi) Are the estimates for investment costs and net energy/cost savings realistic?

vii) What encouragement can be given to the development of energy service companies?

viii) What does business think about the scope for using the flexible mechanisms?

ix) How should we handle the key issues on trading addressed in paragraph 107?

x) What level of interest is there in a form of domestic 'joint implementation'?

xi) What scope is there for large firms to influence the behaviour of its suppliers, customers, employees and shareholders?

xii) Which policies to tackle emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride would be most efficient and cost-effective?

xiii) Are there options besides energy efficiency for reducing carbon dioxide emissions from business?

Transport

GREENHOUSE GAS BASELINE

121. The following baseline figures for the transport sector are consistent with those set out in the UK's Second Report to the UN Framework Convention on Climate Change.

	Sector (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	38	168	Fuel combustion
Methane	0.2	25	Fuel combustion
Nitrous oxide	0.4	18	Emissions from use of catalytic converters
Hydrofluorocarbons	0.01	4.2	Vehicle air conditioning and refrigerated transport
Perfluorocarbons	0	0.2	
Sulphur hexafluoride	0	0.2	
Total	39	216	

1995 is used as the base year for HFCs, PFCs, SF_6

PROGRESS TO 2000

122. The transport sector accounts for 23% of total carbon dioxide emissions, of which 85% comes from road traffic. Estimates of the growth in transport emissions vary, but the most recent figures suggest an increase of around 5% above 1990 levels by 2000.

123. The main tool for reducing emissions from road transport has been the fuel duty strategy. This was a commitment from the last Government to raise fuel taxation by at least 5% a year on average in real terms, and in the last Budget we increased this to 6% over and above inflation. The policy provides both car manufacturers and drivers with a clear, long term signal about the need to develop and purchase more efficient vehicles, invest in maintenance, and adopt a more efficient driving style.

124. Air transport is a rapidly expanding source of emissions, although only domestic flights are included within the UK's baseline. Emissions from international aviation and shipping have not been allocated to countries yet, although the Kyoto Protocol commits parties to working with the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) to progress this and other issues.

125. Forecast emissions for 2000, compared to the 1990 baseline, are set out in the table below.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	38	40
Methane	0.2	0.1
Nitrous oxide	0.4	1.2
Hydrofluorocarbons	0.01	0.04
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	39	41

1995 is used as the base year for HFCs, PFCs, SF_6

PLANNED POLICIES AND ACTIONS FOR 2008-2012

126. Forecast emissions for transport as a whole in 2010 are set out below, alongside emissions from the baseline year of 1990.

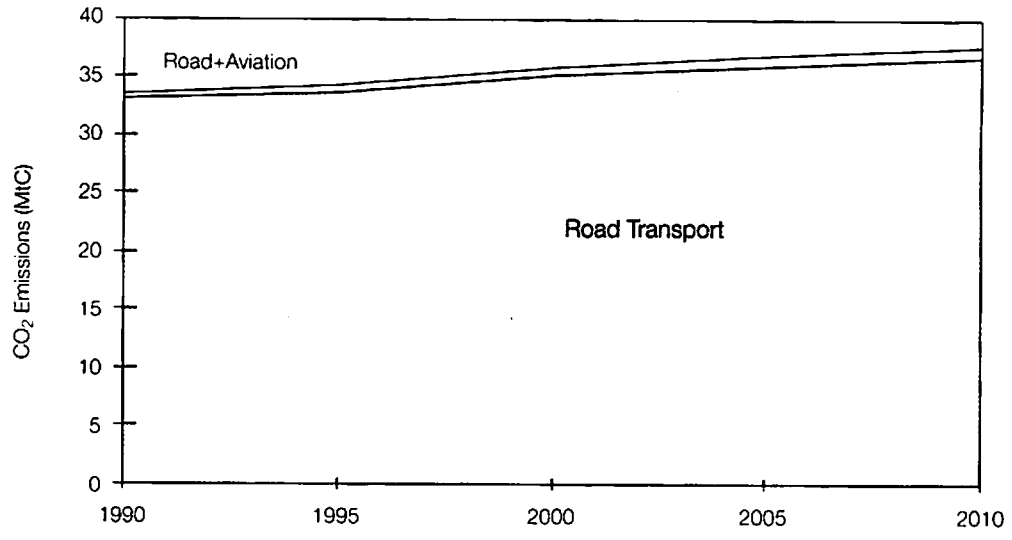
	1990 (MtC equivalent)	2010 (MtC equivalent)
Carbon dioxide	38	40
Methane	0.2	0.1
Nitrous oxide	0.4	1.8
Hydrofluorocarbons	0.01	0.09
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	39	42

1995 is used as the base year for HFCs, PFCs, SF_6

127. Road transport emissions are forecast to continue to rise, reflecting the link between income growth, levels of car ownership, propensity to travel, and increased demands for goods and services. In 1995 the Government estimated that it would rise to about 41.5 MtC by 2010. The effect of policies in place, together with revised estimates of road traffic growth[12], mean that recent projections (as illustrated above for total transport emissions) predict a less steep increase in emissions, to 35.5 MtC. Carbon dioxide emissions from domestic civil aviation are forecast to increase from 0.7 MtC in 1990 to about 1 MtC in 2010.

12 using the 1997 National Road Traffic Forecasts

Road Transport and Aviation CO_2 Emissions



128. Our aim is to reverse this growth – reducing car dependency and encouraging the use of other modes of transport. If we fail to respond to the challenges posed by current transport trends, there will be increasing costs for society from the effect of poor air quality on health and increasing costs on business and society from congestion. Over dependence on the car also limits accessibility and increases social exclusion. A more comprehensive and innovative strategy is needed.

129. Our White Paper, *A New Deal for Transport: better for everyone*, sets out our approach in full. It outlines a plan of action to tackle unsustainable traffic growth and congestion which will bring benefits to the UK as a whole, enhancing our quality of life.

130. Measures to address the growth in greenhouse gas emissions are a central theme of the *New Deal for Transport* and will be central to the new climate change strategy. Early action needs to be taken to ensure that the opportunities that will take time to implement or to change behaviour are realised for 2010. No single measure will deliver the level of change that is required. Action to encourage greater fuel efficiency, through existing tax signals and promotion of cleaner vehicles, will have a central role to play, but a package of smaller-scale measures will be needed to change attitudes and manage demand for transport at a local level. The impact of these initiatives individually is likely to be small, but the cumulative effect could be significant.

Promoting fuel efficiency

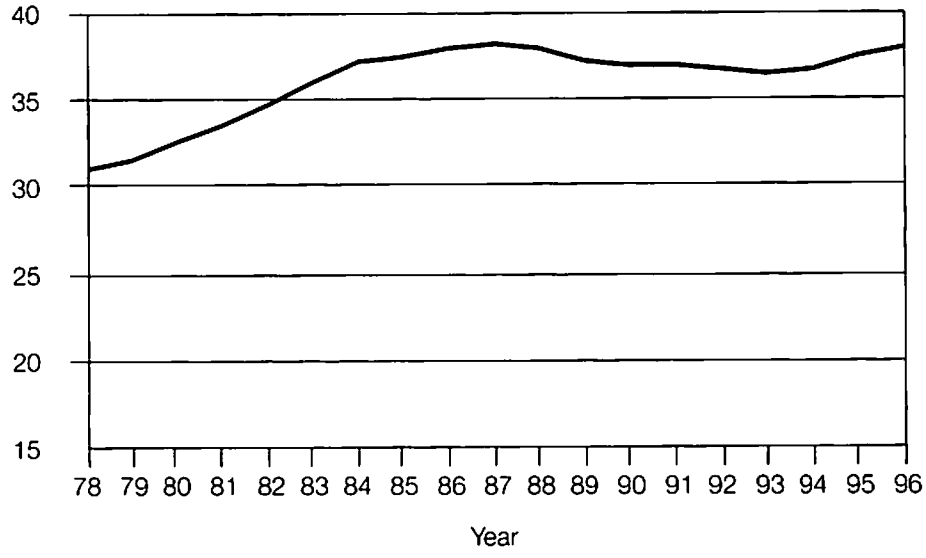
131. We announced last year that we would continue the fuel duty strategy, increasing the escalator to an average of 6% a year in real terms. We estimate that the fuel duty increases between 1996 and 2002 will save around 2-5 MtC in 2010.[13]

132. Higher fuel taxation is an effective tool if drivers can reduce consumption both by reducing their mileage and by using more efficient vehicles. In recent years limited progress has been made on the average fuel consumption of new cars. Trends in the vehicle market towards larger engined vehicles, additional comfort features such as air conditioning, and measures to improve safety

13 Estimate produced using the 1997 National Road Traffic Forecasts and methodology applied in Energy Paper 65.

and local air quality have tended to work against improvements in fuel efficiency. Pre-tax fuel prices fell sharply in 1986, reducing the cost of motoring, and have remained fairly constant since then; however, higher fuel taxation has been steadily reversing this fall. Fuel prices would have to reach very high levels to reverse the trend of rising emissions alone, so an approach that reinforces the existing fuel price signal by encouraging greater vehicle fuel efficiency is crucial if we are to secure reduced emissions.

Average new car fuel consumption



133. We fully support the voluntary agreement which has recently been reached between the European Commission and the car manufacturers to reduce the average carbon dioxide emissions from new cars to 140 grammes of carbon dioxide per kilometre by 2008, a cut of about 25% on the current average. Environment Ministers have set a target of reducing average emissions to 120 grammes of carbon dioxide per kilometre by 2005 or 2010 at the latest. This equates to a 30-40% improvement on current performance.

134. We estimate that the EU carbon dioxide from cars strategy, in combination with increases in fuel duty, could deliver savings in the range of 5-8 MtC in 2010, when compared to a scenario of no further fuel duty increases after 1996.[14]

135. We are developing a new model to update our estimates of the cost to society of raising fuel prices in the light of the new road traffic forecasts. The preliminary results of this analysis suggest that, while higher fuel prices impose a cost on drivers causing many to reduce their car use, there is a benefit from reduced congestion, as well as other benefits from lower traffic levels, such as an improvement to local air quality, noise and accidents. These early results also illustrate that there are distributional effects from higher fuel prices which need to be considered. We will continue to refine this methodology and debate it with external experts so that the conclusions can be used to inform development of our new climate change programme.

136. We are also taking forward other initiatives to drive forward fuel efficiency. The Cleaner Vehicles Task Force has been set up to foster the development, purchase and use of cleaner vehicles, concentrating attention on reducing emissions and energy consumption from new and existing

14 This and other estimates on fuel duty are based on development of the National Road Traffic Forecast framework. Work to improve and refine the methodology behind this framework continues.

vehicles. Included in the wide ranging scope of the Task Force is a study of the impact and potential utilisation of alternative fuels and investigations into the roles and impacts of technology, testing and enforcement. It is also considering options for labelling and how fuel-efficiency might be made a major criterion in the vehicle purchasing policy of major fleet operators. We are also working with freight associations and major fleet operators to apply Best Practice techniques to, for example, driver training and logistics in order to reduce empty running in the freight and business fleet sector.

137. As well as the improvements in vehicle technology which will occur as a result of the voluntary agreement with the European car manufacturers, there is a role for further technological development from other sources. The Foresight Vehicle LINK programme is helping to facilitate the introduction of a number of technologies, including fuel cell technology, electric hybrid vehicles, and aerodynamics.

Other fiscal measures

138. In the last Budget we announced a proposal to change the Vehicle Excise Duty system to offer incentives to more efficient, cleaner vehicles and to consult on our plans. The impact of this measure is likely to be relatively small and will depend on the level of the differential introduced. However, it will send an important signal to the market, underpinning the fuel duty strategy and the voluntary commitment by the car industry.

139. We have also announced substantial increases in this and the next four years in the scale charges for free fuel provided by employers for private use in company cars.

Demand management and modal shift

140. We are promoting a number of initiatives which could transform the market for cleaner vehicles and public attitudes to transport. We launched our new advertising campaign *Are You Doing Your Bit?* in March this year. Evaluation of this first burst of advertising showed an encouraging increase in awareness about the link between individual car and energy use and climate change. We plan to develop this campaign over the next few years.

141. The way we plan new developments has a direct effect, particularly in the longer term, on our need to travel and the means by which we do so. We have announced revisions to planning policy guidance aimed at ensuring that development plans – and decisions on individual applications – help to reduce the need to travel, especially by car, and promote walking, cycling and public transport.

142. Some 30% of car journeys are to get people to work or school, or part of the day to day business of organisations. Business use of transport alone accounts for about 10% of total UK carbon dioxide emissions. We are encouraging the much wider adoption of 'green transport plans' and other action by organisations to help realise the huge potential for improving the efficiency of work related travel. We are also encouraging local authorities to implement 'safer routes to schools' schemes designed to promote walking, cycling and public transport as alternatives to the car for journeys to school. The Energy Efficiency Best Practice Programme will also continue to stimulate improvements to fleet management.

POSSIBLE FUTURE POLICIES

Demand management and modal shift

143. *A New Deal for Transport: better for everyone* outlined a package of measures which, by attacking congestion, would reduce carbon dioxide emissions. Even cautious estimates suggest congestion increases carbon dioxide emissions on urban roads by 10%. Local authorities will have a key role in implementing these policies through the development of local transport plans[15]. These plans will outline packages of measures including, for example, bus quality partnerships, traffic management and calming, road user and parking charges, and freight quality partnerships. They will also cover walking and cycling.

144. The level of reductions from these measures depends on the timing of legislation and the extent to which local authorities take up their new permissive powers for charging. We estimate that if there was full take-up in urban areas at least the size of somewhere such as Southampton, savings of 0.8 MtC would be achievable in 2010. If take-up was restricted to London and about a third of those other urban areas savings would be about 0.3 MtC. These savings will be increased as other measures have an impact.

145. Changes in individual attitudes to transport on a large scale could produce significant reductions in emissions from transport. Therefore increasing public awareness of the impact that their decisions have on greenhouse gas emissions, to stimulate changes in behaviour, will be a critical element of the strategy. Individuals must recognise that they can make a real difference by choosing to purchase more fuel efficient cars, keeping them well maintained, and driving them less. It will also save them money. However, we do not underestimate the challenge in delivering this kind of change.

Fiscal measures

146. The level of fuel taxation will clearly be a factor in determining whether forecast improvements in fuel efficiency are translated into increased mileage or carbon savings.

147. In the last Budget we invited comments on the case for replacing the existing business mileage discounts with discounts for driving fewer private miles in company cars. Many individuals and organisations responded to that invitation, and the comments received are being carefully considered.

Other options

148. Improved consumer information could complement initiatives to drive greater fuel efficiency through higher prices. The European Commission have proposed a Directive to introduce compulsory fuel consumption labelling on all new cars. If agreed, this would build on a system already operating in the UK. The Cleaner Vehicles Task Force is also considering this option.

149. *A New Deal for Transport* announced a review to develop a speed policy that takes account of the contribution of reduced speeds to environmental and social objectives as well as to road safety. This review will aim to develop a practical and cost-effective approach which meets our wider policy objectives, including reductions in carbon dioxide emissions. As an illustration of the possible impact of action on speed policy, strict enforcement of the 70mph speed limit or the

15 Local transport strategies in Scotland.

fitting of speed limiters to the whole fleet could save between 0.4-2.8 MtC; enforcement of a lower national speed limit might increase the carbon savings still further.

150. Hydrofluorocarbon emissions from vehicles are rising in line with consumer demand for air conditioning. Leakage rates are relatively high during use and servicing and we are considering introducing policies, such as maximum leakage rates and registration and training of service mechanics, to address this problem (for other policies on hydrofluorocarbons see the *Business* chapter). More research is required to determine the level of leakage which occurs during servicing and replacement and we have commissioned a study to identify the extent of the problem.

151. We will continue to pursue in the International Civil Aviation Organisation the potential for environmental levies and to press for removal of the exemption from tax on aviation fuel, to encourage fuel efficiency. However, such measures will not have much impact in meeting our Kyoto target, as international flights are not counted within domestic totals.

SUMMARY

152. The main policies central government could use to tackle transport emissions are summarised in the table below, together with an illustrative level of carbon savings possible, estimated costs, and other relevant factors. The distributional implications of the policies have not been identified explicitly, but will need to be incorporated in the evaluation process. Comments on these figures would be welcome.

Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
6% per annum fuel duty escalator to 2002[16]	2-5		New welfare estimates in development. Benefits from reduced congestion and other environmental improvements. Distributional impacts.
Achievement of the EU's CO_2 from cars target	5-8	Increase in new car prices due to delivery of voluntary agreement	Policies on top of the agreement will be needed to deliver target.
Local transport measures (full take-up in areas greater than 25km^2)	0.8		Cost likely to be negative because of improved efficiency
Local transport measures (take-up in London and 1/3 all areas greater than 25km^2)	0.3		Cost likely to be negative because of improved efficiency
Changes to VED			Level of impact would depend on detailed proposals, particularly the level of differential.
Changes to company car tax regime			Level of impact would depend on the details of any changes made to the system.
Strict enforcement of 70mph speed limit	0.4-2.8		
Local transport plans			Savings depend on level of local authority interest
Business green transport plans			Savings depend on extent of business take-up
EC fuel consumption			Measure included within labelling overall EU CO2 from cars strategy
Remove aviation fuel tax exemption			Await conclusions of EU study on impact of removal of exemption

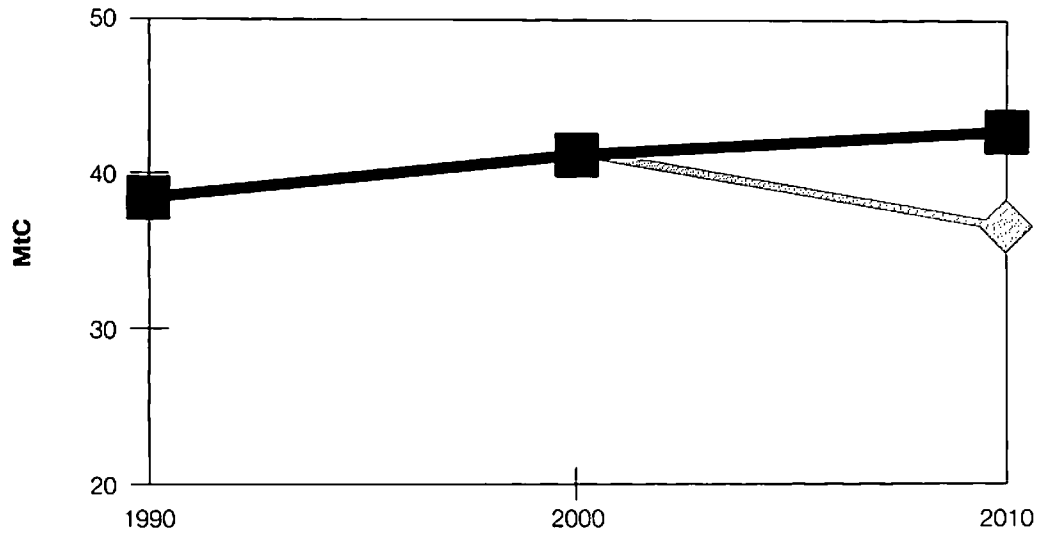
16 Savings from this measure are already included in the baseline as part of the new National Road Traffic Forecasts

The table below suggests a possible classification of the available savings for the Transport sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Transport	42.4	4	2

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.

Transport



Projected emission levels from the Transport sector with and without possible measures.

QUESTIONS

i) Which other measures would most effectively strengthen the impact of the fuel duty escalator?

ii) Are our estimates of the impact of higher fuel prices and the EU CO_2 from cars strategy in the right range?

iii) What would be a realistic estimate of likely implementation of local transport packages by local authorities? How can we maximise the benefits?

iv) How can we best stimulate changes in the attitudes and behaviour of organisations and individuals?

v) Which other measures in the transport sector would have the greatest impact?

Domestic sector

153. This section covers emissions from the domestic sector. The greenhouse gas emissions from generation of electricity used by this sector are included in total figures.

GREENHOUSE GAS BASELINE

154. The baseline figures for the domestic sector are consistent with those in the UK's Second Report to the UN Framework Convention on Climate Change.

	Sector (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	43	168	Domestic fuel use
Methane	4.1	25	Waste disposal
Nitrous oxide	0	18	-
Hydrofluorocarbons	0.02	4.2	Largely refrigeration losses
Perfluorocarbons	0	0.2	-
Sulphur hexafluoride	0	0.2	-
Total	47	216	

1995 base year used for HFCs, PFCs, SF_6

PROGRESS TO 2000

155. A range of policies have been used by the Government to stimulate take-up of energy efficiency measures in the home. These have included advice and information designed to change behaviour, financial incentives, and tighter building regulations. We have also encouraged others to play their part in promoting energy efficiency. Reduction in the carbon intensity of electricity generation has also had an impact. As a result domestic carbon emissions are expected to fall from 43 MtC in 1990 to 38 MtC in 2000, a reduction of 5 MtC. Lower carbon intensity of electricity generation and improvements in the efficiency of energy use in homes are projected to be of equal importance in reducing emissions in 2000.

Government action

Advice and Information

156. Information on how energy efficiency can save money is provided through the *Energy Efficiency* campaign, which is run by the Energy Saving Trust and funded by the Government and the private sector. Government's *Are You Doing Your Bit?* campaign increases awareness about the link between energy use and climate change. The Energy Saving Trust's 50 Energy Efficiency Advice Centres provide free impartial advice to householders. By the end of 1998 over 450,000 households are expected to have received advice from the centres.

157. Building professionals and housing stock managers in housing associations and local authorities have used information provided by the Energy Efficiency Best Practice Programme to make significant improvements in energy efficiency standards for new and refurbished housing. The Housing Corporation, for example, uses the Government's Standard Assessment Procedure for home energy rating to set demanding energy efficiency standards for housing development projects. In addition, the establishment of higher Building Regulation standards is considerably eased through projects with commercial builders which demonstrate how improved designs and new technologies can be incorporated cost-effectively into buildings.

Financial incentives

158. We fund financial incentives to help the less well off improve the energy efficiency of their homes. The Home Energy Efficiency Scheme (HEES), which provides grants for energy efficiency measures for the less well off and the elderly, focuses on improving living conditions, but it has also contributed to carbon savings.

159. Other measures targeted at social landlords have provided advice on the scope for energy efficiency improvements to their housing stock.

160. The Energy Saving Trust runs government funded incentive schemes to encourage energy efficiency by those who can afford it. They aim to promote consumer take-up of energy efficiency measures and stimulate the market to the point where it becomes self-sustaining. So far, the programme has provided financial assistance for some 130,000 people to install energy efficiency measures in their homes.

Building Regulations

161. A revised Part L of the Building Regulations came into effect in July 1995 and had the effect of increasing the minimum energy performance of new houses and extensions or conversions. It is estimated that this change will have reduced carbon emissions from the domestic stock by 0.1-0.15 MtC each year in 2000.

Role of others

162. Many local authorities have for some time offered information and advice on energy efficiency to householders. This is expected to increase as the Home Energy Conservation Act takes effect. The Act requires local authorities to report on their plans to make significant improvements in energy efficiency in all homes in their areas.

163. The electricity Standards of Performance (SOPs) programme, funded by consumers, currently amounts to about £25 million a year. It requires the electricity supply companies to support projects to help domestic and small business customers to save energy. Most SOP projects are run by individual companies; others are national programmes managed by the Energy Saving Trust on behalf of all the companies; in Scotland the managing agents are Energy Action Scotland. We estimate that by 2000 the scheme will have stimulated savings of about 0.2 MtC a year. The energy regulators also require energy suppliers to provide customers with energy efficiency advice on request.

164. Forecast emissions for 2000, compared to the 1990 baseline, are set out below.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	43	38
Methane	4.1	3.3
Nitrous oxide	0	0
Hydrofluorocarbons	0.02	0.1
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	47	41
1995 base year used for HFCs, PFCs, SF_6		

PLANNED POLICIES AND ACTION FOR THE PERIOD TO 2008-2012

165. Forecast emissions for 2010 are set out below, alongside emissions for the baseline year of 1990 (1995 for HFCs).

	1990 (MtC equivalent)	2010 (MtC equivalent)
Carbon dioxide	43	38
Methane	4.1	2.5
Nitrous oxide	0	0
Hydrofluorocarbons	0.02	0.2
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	47	41
1995 base year used for HFCs, PFCs, SF_6		

Carbon dioxide

166. Carbon dioxide created by energy use in the home is the most significant source of greenhouse gas emissions from the domestic sector. On the basis of current policies, carbon dioxide emissions are expected to decline by about 12% between 1990 and 2010. This takes account of the projected growth in the total number of households, the steady but slow improvement in the energy efficiency of homes, the increased use of electrical appliances in the home, the reduction in VAT on domestic fuel and power, and the expected fall in prices following market liberalisation.

167. The broad package of policy measures in the years to 2008-2012 is expected to be similar to that for the years up to 2000 (paragraphs 155-163), but some existing programmes are expected to have an increased impact after 2000 and some significant extensions to the programme are in the pipeline.

Government funding

168. The Comprehensive Spending Review increased the funds which will be available for energy efficiency between 2000 and 2002. An extra £150 million is to be added over the next three years to the budget of the Home Energy Efficiency Scheme, creating a new expanded fuel poverty programme. This will enable more properties to benefit from more comprehensive energy efficiency measures, and significant improvements in affordable warmth. While carbon saving is not the primary purpose of fuel poverty programmes, there will be some reduction in emissions. Planned support for the Energy Saving Trust has also been increased from £19 million in 1998-99 to £25 million in 2000-2001 and 2001-2002. There will also be increases in funding for the Energy Efficiency Best Practice Programme.

169. An additional £3.6 billion will be available to local authorities over the next three years to tackle the backlog of repairs to council housing in England and Wales. Local authorities have already committed an extra £330 million to energy efficiency on their own stock as a result of the Capital Receipts Initiative. An additional £0.6 billion will be made available for the *New Deal for Communities*. Much of this will be spent on housing, in all sectors, in the most deprived areas. Together these initiatives are likely to lead to a significant improvement in the energy efficiency of the housing stock, which we estimate will save up to 0.5-1 MtC in 2010.

170. In Scotland, £330 million has been made available for New Housing Partnerships. In addition, over £7.5 million has been allocated for linking energy efficiency to the New Deal for the young, long-term unemployed.

Increased use of energy efficient domestic appliances

171. Our *Market Transformation Strategy* seeks to get producers to make and the commercial sector to sell appliances which do less harm to the environment, particularly by using less energy. It also seeks to ensure that consumers have the information they need to make informed choices in purchasing these goods. The cost-effective potential (including lighting) by 2010 is estimated to be around 1-2 MtC. Energy labels are already mandatory for fridges, washing machines, washer-dryers and tumble dryers. Regulations for dishwashers and light bulbs should be introduced this year, and further proposals are under development.

Fiscal measures

172. We announced in the last Budget that VAT would be reduced on energy saving products used in certain grant funded programmes.

Action by local authorities

173. The Government will continue to encourage energy efficiency initiatives by local authorities, building on the Home Energy Conservation Act, the Energy Saving Trust's HECA Action Programme, the Housing Investment Programme and associated initiatives. Local authorities, as part of their work under the Home Energy Conservation Act, have already identified significant potential for energy efficiency improvements in the domestic sector, building on existing programmes.

Methane

174. The domestic sector is currently responsible for about 16% of UK methane emissions. 20% of the UK's annual waste originates from households and produces methane when disposed of in landfill and wastewater treatment. Methane emissions from disposal of domestic wastes may fall by about 40% by 2010, largely through the implementation of the EU Landfill Directive, improved waste

management practices and the application of Integrated Pollution Prevention and Control to landfills.

175. The consultation paper on a new waste strategy for England and Wales, *Less Waste: More Value*, stresses the importance of waste minimisation by households and the need to reduce the amount of biodegradable municipal waste sent to landfill. Progress in this area would reduce methane emissions. The Scottish Environment Protection Agency is currently preparing a similar document.

Hydrofluorocarbons

176. These emissions are currently very low. However, they are expected to rise significantly by 2010, largely from the use of hydrofluorocarbons as a refrigerant in domestic appliances as a replacement for ozone-depleting substances. The UK market has almost entirely shifted to hydrofluorocarbon technology, whereas in large parts of Europe, hydrocarbon technology dominates the market for domestic refrigeration. While there are only low emissions from refrigeration during normal use, hydrofluorocarbons can be emitted if the appliance is damaged and on final disposal. Policies to reduce hydrofluorocarbon emissions are discussed further in the *Business* chapter.

POSSIBLE FURTHER POLICIES

Carbon dioxide

177. There has been much debate over the scope for reducing emissions from the domestic sector. There may be the potential to reduce carbon dioxide emissions to as little as 33 MtC by 2010 by improving energy efficiency, that is 5 MtC below what is currently expected. Our work has focused on the potential savings from different energy efficiency measures. There can be no firm conclusions. Improving domestic energy efficiency depends on the decisions of millions of individuals, and influencing them is a major and unpredictable task. Although we can be reasonably confident about the overall scope for cost-effective improvements, we are less so about how we best persuade householders and landlords to make these investments, how much it might cost, and what proportion of the energy efficiency improvement will be taken as reduced consumption as opposed to increase in comfort.

178. We are exploring a number of approaches to the further promotion of energy efficiency and have undertaken preliminary work on the costs and benefits of a sample of measures. In all cases the aim must be to encourage action and to overcome the barriers of inertia, short-term affordability and the availability of capital.

A partnership to promote energy efficiency

179. We are supporting the development of a partnership of all those with an interest in promoting domestic energy efficiency to provide a framework to enable the UK to meet its aim to reduce carbon dioxide emissions from the domestic sector. Partners are expected to include central and local Government, retailers, manufacturers, installers, energy suppliers, consumer organisations and organisations and agencies concerned with energy efficiency. The development of the partnership is being taken forward by all the prospective partners, facilitated by the Energy Saving Trust.

Standards of Performance

180. We are examining the possibility of promoting energy efficiency through a new Standards of Performance scheme. We are exploring with the energy industry and others the advantages and disadvantages of such a mechanism in the new context of the liberalised market. If a decision were to be taken to pursue this approach, a programme along these lines would offer opportunities for the development of flexible and innovative schemes and could help to stimulate the development of energy services companies in the domestic and small business sectors.

Fiscal measures

181. We are also exploring opportunities for agreement at European level on a wider reduced rate of VAT on energy saving materials and installations. EU Environment Ministers have reinforced this call by inviting the Commission to consider proposals for allowing such reduction in VAT levels.

182. We have made clear that we will not impose new taxes on the domestic use of fuel and power. This would have an unacceptable social impact and runs counter to our objective of cutting fuel poverty. The cut in VAT on domestic fuel and power made last year signalled a determination to use other, more equitable, instruments.

Building Regulations

183. We are currently reviewing the energy efficiency aspects of the building regulations, as well as considering improving performance standards for building work (this is discussed further in the *Business* chapter).

Community heating and combined heat and power

184. Alongside other domestic energy efficiency measures, wider use of community heating and combined heat and power would increase carbon savings. In practice, community heating schemes serve some council and other public sector users as well as domestic users. ETSU and BRECSU have just completed a review of the potential for community heating, which points to there being scope for an additional 2000 megawatts of cost effective combined heat and power capacity. This could provide a carbon saving of around 1.5 MtC a year by 2010.

Costs and benefits of sample energy efficiency measures

185. The possible range of measures has been extensively researched. The results suggest that most readily achievable and cost effective measures are: cavity wall insulation; condensing boilers in conjunction with high efficiency controls; compact fluorescent light bulbs; and high efficiency appliances.

186. This analysis suggests that programmes including these measures could achieve carbon savings of between 2-4 MtC a year by 2010, with capital investment of around £150-400 million a year, and there could be substantial net savings to consumers. However, the subsidy required to unlock these savings remains uncertain. These cost estimates are based on a number of key assumptions[17]. The key variables include future fuel cost projections; patterns of fuel use; capacity constraints in the supply industry; the level of incentive necessary to encourage take-up; the "dead weight" factor from programmes, which could be significant; and the extent to which savings are taken through warmer and more comfortable homes rather than carbon reductions. Cautious estimates have been made for all of these factors. We would welcome comments on our assessment of costs and benefits.

17 These are explained in more detail in a supporting paper available from the DETR web site http://www.detr.gov.uk.

Increased use of energy efficient domestic appliances

187. Most measures to improve the energy efficiency of domestic appliances will be adopted at a European level. We therefore fully supported the decision of EU Environment Ministers to ask the Commission to produce a prioritised action plan for a programme of improved and dynamic product measures, building on those already in place, and we will continue to press for early progress.

Hydrofluorocarbons

188. We are considering options for reducing hydrofluorocarbon emissions from domestic refrigeration units (this is also discussed further in the Business chapter). Greater penetration of hydrocarbon technology in the UK market would also have an impact.

SUMMARY

189. Examples of the main policies we could use to tackle emissions from the domestic sector are summarised in the table below, together with an illustrative level of carbon savings possible, estimated costs, and other relevant factors. The distributional implications of the policies have not been identified explicitly, but will need to be incorporated in the evaluation process. Comments on these figures would be welcome.

Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
Energy efficiency measures (including a possible SOP scheme, Home Energy Conservation Act and Market Transformation)	2-4	£60-£180 welfare benefit	Would require annual capital investment of between about £150m and £400m Includes all measures except CHP/Community heating
Building regulations	0.1-0.15		Depends on outcome of current review of Part L of the Building Regulations
NFFO-type scheme to promote additional CHP linked to community heating	around 1.5	of the order £100 benefit	Schemes probably initiated in *Public* or *Business* sectors, with benefits shared.

190. The assumed energy efficiency measures incorporated within the table above are broken down in more detail in the following table.

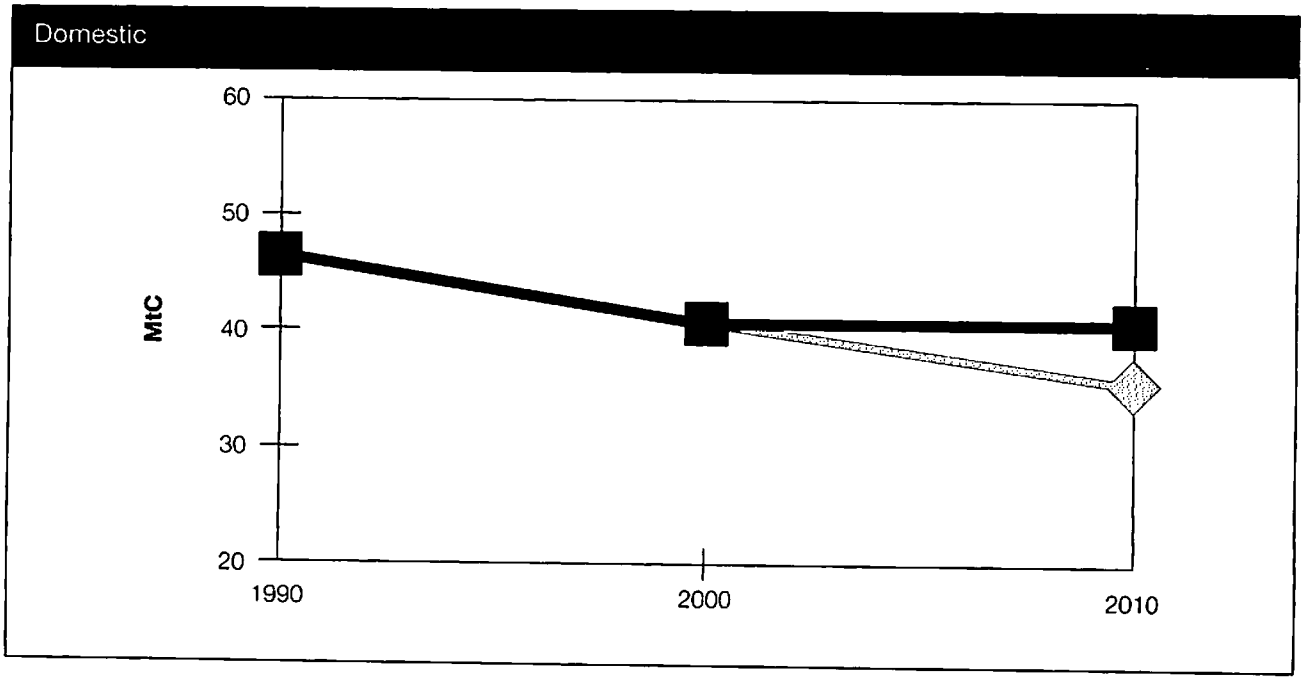
Possible measures	Savings (t C/1000 households)	Capital cost (£/households)	Possible mechanisms	Comments
Cavity Wall Insulation	165-250	250-300	SOPs CRI HEES[18]	
Condensing boilers & controls	230-340	150-250	SOPs CRI HEES	
Compact Fluorescent Light bulbs	20-25	10-40	SOPs CRI HEES Market Transformation	
Other Insulation	140-210	100-230	SOPs CRI	Remaining loft and tank insulation
Electrical appliances	5-15	0-35	SOPs Market Transformation	Mainly fridges and freezers

18 Standards of Performance scheme; Capital Receipts Initiative; Home Energy Efficiency Scheme

191. The table below suggests a possible classification of the available savings for the Domestic sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Domestic	41	3.0	3.5

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.



Projected emission levels from the Domestic sector with and without possible measures.

QUESTIONS

i) Is it realistic to aim to reduce domestic sector carbon dioxide emissions in 2010 by 10 MtC below the 1990 level?

ii) Which energy efficiency measures are likely to be the most cost-effective, and what information is available about the cost of those measures?

iii) What barriers exist to the take-up of the most promising energy efficiency measures?

iv) Which public and private sector organisations have a role to play in developing energy efficiency policies, and who should take the lead?

Agriculture, Forestry and Land Use

GREENHOUSE GAS BASELINE

192. Agricultural processes both release and absorb greenhouse gases. The crop cycle itself is assumed to be neutral; emissions mainly result from digestive processes in animals, animal wastes and fertiliser use. Increases in forest coverage or the amount of organic matter in the soil remove carbon from the atmosphere. Conversely, practices such as peat and fenland drainage, timber harvesting, or grassland to arable conversion lead to loss of soil carbon, and the use of fossil fuels and electricity leads to greenhouse gas emissions, just as in other sectors.

	Sector (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	10.6[19]	168	Land use change, energy use, liming of soils
Methane	6.2	25	Digestive processes in animals, animal wastes
Nitrous oxide	8.8	18	Animal wastes, chemical fertilisers
Hydrofluorocarbons	0.01	4.2	Refrigeration and air conditioning
Perfluorocarbons	0	0.2	
Sulphur hexafluoride	0	0.2	
Total	26	216	

1995 base year used for HFCs, PFCs, SF_6

PROGRESS TO 2000

193. Agricultural emissions are difficult to estimate with accuracy because they result from highly variable biological processes and numerous and diffuse sources. Further uncertainty is created as agricultural practices and production depend heavily on the Common Agricultural Policy, and the ongoing negotiations on the reform proposals known as *Agenda 2000* make predicting future emissions even more uncertain.

194. We project a fall in emissions largely due to reduced use of inorganic fertilisers, falling cattle numbers and reduced emissions from land use change. For example, the introduction of policies which either encourage or require less intensive farming is likely to reduce nitrous oxide emissions. Programmes such as the *Environmentally Sensitive Areas* and *Countryside Stewardship* schemes encourage lower levels of animal stocking and often limit fertiliser inputs. Commercial pressures on farmers have also stimulated more efficient and targeted use of nitrogen fertilisers.

19 made up of 8.6 MtC from soil cultivation, urbanisation and peat extraction; 1.6 MtC from energy use; and 0.4 MtC from liming of soils

195. Land use change is brought about by a wide variety of factors and results in either uptake or loss of carbon dioxide from soil. Although the exact volume of emissions is uncertain, factors that increase the release of carbon dioxide include soil cultivation, urbanisation, and peat drainage and extraction. Soil processes are very slow; emissions today result from actions taken decades ago and short term mitigation is difficult. Emissions are predicted to decline, although policy decisions taken now could reduce emissions further in the years to come. This is particularly important when considering action beyond the 2008-2012 commitment period.

196. The UK already has policies in place which are consistent with its responsibilities under the Convention to protect and enhance carbon sinks, such as forests. We continue to support the planting of new woodland.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	10.6[20]	9.3[21]
Methane	6.2	5.8
Nitrous oxide	8.8	7.7
Hydrofluorocarbons	0.01	0.02
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	26	23
1995 base year used for HFCs, PFCs, SF_6		

CURRENT POLICIES AND PLANS TO 2008-2012

197. Forecast emissions in 2010 are set out below, alongside emissions from the baseline year of 1990.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	10.6[22]	8.4[23]
Methane	6.2	5.7
Nitrous oxide	8.8	7.6
Hydrofluorocarbons	0.01	0.05
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	26	22
1995 base year used for HFCs, PFCs, SF_6		

20 made up of 8.6 MtC from soil cultivation, urbanisation and peat extraction; 1.6 MtC from energy use; and 0.4 MtC from liming of soils

21 made up of 7.6 MtC from soil cultivation, urbanisation and peat extraction; 1.3 MtC from energy use; and 0.4 MtC from liming of soils

22 made up of 8.6 MtC from soil cultivation, urbanisation and peat extraction; 1.6 MtC from energy use; and 0.4 MtC from liming of soils

23 made up of 6.8 MtC from soil cultivation, urbanisation and peat extraction; 1.2 MtC from energy use; and 0.4 MtC from liming of soils.

198. The UK must implement the Integrated Pollution Prevention and Control Directive between 1999 and 2007. This will extend the pollution control regime to intensive pig and poultry units. We expect guidance notes governing authorisations for such installations to deliver improvements in energy efficiency and reductions in diffuse nitrogen emissions. For the time being the measures are likely to focus on ammonia – an acidifying rather than greenhouse gas – because abatement techniques are better developed than for nitrous oxide. Nevertheless, requirements for better nutrient management should give rise to a reduction in nitrous oxide losses. The guidance can be revised over time and we would expect that, as knowledge improves, specific recommendations for controlling nitrous oxide could be developed. Negotiations in the EU and UNECE are also likely to result in measures to control agricultural ammonia, and we anticipate that these will have a similar knock-on effect on nitrous oxide.

199. The best long-term prospect for significantly reducing methane emissions lies in improving animal diet and productivity and research on these themes continues in the UK and elsewhere. However, large reductions are unlikely because the most probable methods of achieving them would run counter to consumer concerns over animal welfare and intensive livestock farming. There are limited opportunities for reducing the much smaller proportion of methane emissions from animal waste beyond the decline already forecast, because technical difficulties in containing and utilising small quantities of gas on farms, together with often unfavourable economics, limit the scope for change.

200. Nitrous oxide emissions are already falling because of decline in total nitrogen fertiliser use. This is mainly because the economically optimal rate of fertiliser application is dependent on the price received for the harvested crop, and EU support policy is moving these prices downwards towards world prices. Further reductions in support are proposed under *Agenda 2000*. The uptake of agri-environment schemes will also continue to make a contribution, as will implementation of the rules for Nitrate Vulnerable Zones.

201. Wider adoption of good agricultural practice could have an impact on nitrous oxide emissions. We are planning to revise and relaunch the Codes of Good Agricultural Practice and introduce a pro-active marketing strategy to ensure that they reach more farmers and that they are observed. We will underpin this strategy by using demonstration farms which will, among other things, give farmers practical examples of measures to improve their efficiency in nutrient use. Dissemination of new methods for estimating and targeting fertiliser requirements will also be critical.

202. We are committed to a steady expansion of our woodland area and are considering how forestry policy can be developed to meet climate change objectives, within the framework of our broader environmental guidance and incentives for forestry. We plan to publish a new forestry strategy for England shortly. At present, various incentive schemes are increasing tree cover at the rate of about 20,000 hectares a year. Farmers can also contribute: the *Farm Woodland Premium Scheme* encourages the planting of woodlands on land currently in productive agriculture. The present rate of increase in tree cover is likely to contribute about 0.25% towards the UK's commitment under the Kyoto Protocol. The total uptake by sinks from UK agriculture and forestry is projected to increase from about 1.7% of UK carbon dioxide emissions in 1990 to 2.6% in 2010, although not all of this could be counted towards meeting the UK's commitment under the Kyoto Protocol.

POSSIBLE FURTHER POLICIES

203. Once the *Agenda 2000* package has been put in place, we shall be looking at the scope that it offers, such as for the encouragement of energy crops which can reduce emissions when used in substitution for fossil fuels. The scope for additional significant and cost-effective reductions in agricultural emissions is fairly limited due to the complexity of biological processes and because the nature of the agriculture sector, with many small operators and different types of operation, makes changes uncertain and hard to deliver. Some areas of potential reduction would also need significant research effort and lengthy lead times for implementation.

204. Our new and renewable energy programme and the EU's White Paper on renewables both emphasise the potential for substantial growth in the amount of energy generated from biomass including energy crops, forest residues, poultry litter and crop residues. Short rotation coppice is currently the most suitable energy crop for UK conditions, as it is capable of being grown productively on both arable and reasonable quality pasture land. It has one of the highest energy yields and development is well advanced. In the short-term existing resources are being targeted by the Forestry Commission to stimulate plantings for Project Arbre in Yorkshire. Our current review of renewable energy policy is considering what contribution energy crops might best make to meeting climate change and renewable energy targets, and looking at options for funding. We will also need to be sensitive to other environmental issues, such as biodiversity and landscape effects.

205. The European Commission has been asked by the Agriculture Council to prepare a report on the current state and future development of the energy crop sector. This will provide an opportunity to discuss possible EU support for energy crops within the *Agenda 2000* context.

206. We are considering the scope for using economic instruments to improve efficiency of resource use. In the context of water pollution, we have already issued a discussion paper which considered some options such as a charge on chemical fertilisers. Further work would be needed to establish whether a charge or other economic instrument would be an effective means of delivering environmental improvements. In the longer term, it may be possible to explore the use of other economic instruments such as different forms of permit trading although a number of practical difficulties would need to be overcome.

207. A number of private sector organisations have developed initiatives which allow consumers to fund increases in carbon sinks, at home or overseas, to offset their emissions. We welcome such imaginative schemes as a way of funding the development of sinks, as well as raising public awareness about the impact that individual actions have on emission levels and the need for offsetting action. We believe, however, that the first priority must be to reduce emission levels as the most effective and secure way of delivering the UK's targets.

SUMMARY

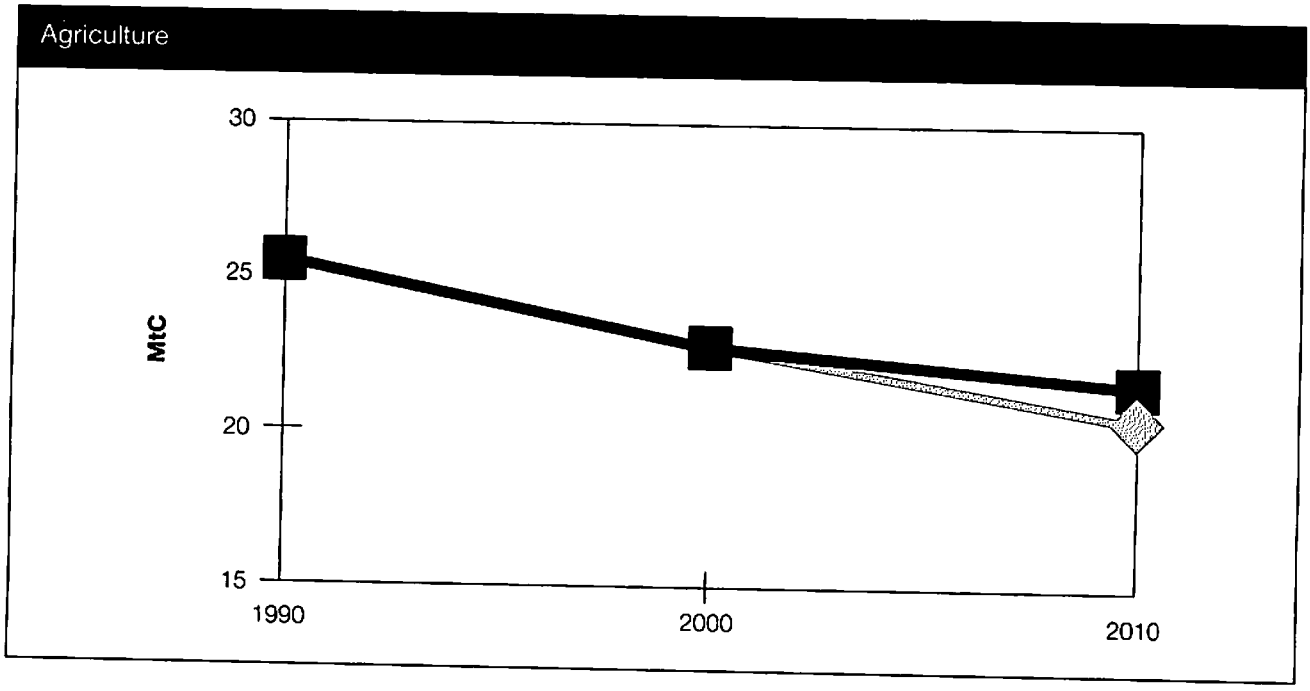
208. Current proposals to reform the Common Agricultural Policy are likely to have a mixture of positive and negative effects on agricultural emissions. The new regime will also set the framework against which any new measures, for example on energy crops, will be set. However, the nature of the reform is uncertain and negotiations are still in progress.

Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
IPPC implementation/ EU Acidification strategy			Rules to implement new regulations still under discussion, but small savings in CO_2 and N_2O expected
Codes of Good Agricultural Practice and Demonstration projects			Measures to encourage further adoption of good practice should lead to reductions in N_2O emissions, as well as other environmental problems
Afforestation (stimulated in part by incentive schemes, such as *Farm Woodland Premium Scheme*)	0.5	£50-80	Benefits from increased carbon in the soil, improved biodiversity and scenery and new recreational opportunities
Energy crops – area of 125,000 hectares short rotation coppice	0.25 – 1.1	£12-50	Similar benefits to afforestation, including increase in soil carbon. Would also provide about 1% of UK electricity needs. Cost figures relate to the additional assistance towards the cost of establishing the crop which would be needed to secure planting of 125,000 hectares in the UK. NFFO costs are included within the *Energy Supply* chapter. Savings are not additional to the 3.5 MtC for renewables already considered in the *Energy Supply* chapter.
Measures on animal wastes: improving animal diet and productivity, containing and utilising emissions from animal waste			Limited scope in short term. Technical difficulties

209. The table below suggests a possible classification of the available savings for the Agriculture, Forestry and Land Use sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Agriculture, Forestry and Land Use	22	0.5	–

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.



Projected emission levels from the Agriculture, Forestry and Land Use sector with and without possible measures.[24]

QUESTIONS

i) What measures would be most likely to reduce emissions from agriculture beyond current projections?

ii) Are cost-effective measures likely to be available now or in the future that would further reduce emissions from livestock production and nitrogen application to land?

iii) What is the potential for using biomass, especially energy crops, as a renewable energy source? What are the constraints, and how might they be overcome?

iv) What scope or restraint is there for increases in carbon sinks through forestry?

24 The lower "with measures" line includes savings from energy crops which would not be additional to the savings attributed to renewable energy in the energy supply chapter.

Public sector

210. The public sector includes the central government estate (including agencies and non-departmental public bodies), but also the estates of the National Health Service, local authorities (except their housing stock, covered in the *Domestic* section) and the education sector.

GREENHOUSE GAS BASELINE

211. The baseline figures for the public sector are:

	Sector (MtC equivalent)	National (MtC equivalent)	Major sectoral emission sources
Carbon dioxide	8.7	168	energy use
Methane	0.9	25	waste
Nitrous oxide	0	18	
Hydrofluorocarbons	0.01	4.2	refrigeration and air conditioning
Perfluorocarbons	0	0.2	
Sulphur hexafluoride	0	0.2	
Total	9.7	216	

1995 is used as the base year for HFCs, PFCs, SF_6

212. The public sector is also responsible for managing the majority of waste disposal, and at the moment nearly 85% of municipal waste goes to landfill. For the purposes of this paper, methane emissions have been allocated to the major sectors generating the waste (*Domestic*, *Business* and *Public*) with only a small proportion arising directly from the public sector.

PROGRESS TO 2000

213. The previous Government set a target of improving energy efficiency in its own estate by 15% over 1990 levels by March 1996. This was achieved, and by March 1997 carbon dioxide emissions had been reduced by nearly 18%, a reduction of 0.2 MtC. We have already extended our target for energy efficiency across the Government estate, aiming to reach a 20% improvement on 1990 levels by March 2000.

214. Local authorities have also pursued energy efficiency strategies. The former local authority associations endorsed targets in line with that for the Government estate and authorities themselves have made considerable efforts to improve energy efficiency in their own estate, and in their area through Local Agenda 21. We have announced that we would like all local authorities to adopt Local Agenda 21 strategies by 2000; this will provide a useful vehicle for further initiatives to reduce greenhouse gas emissions.

215. Many schools have achieved energy efficiency improvements, either as part of local authority strategies, or separately. Advice has been provided by the Energy Efficiency Best Practice Programme and by the Department for Education and Employment, financial assistance from the Energy Saving Trust, and since the election, we have allocated £1.1 billion of new funds to improve school buildings, with energy efficiency playing an increasingly important part. We have also set energy targets for new buildings in terms of annual carbon dioxide emissions. Emissions reductions are particularly difficult to track in the schools sector, but a figure of 0.2 MtC is estimated for 2000. In further and higher education a collective self-help initiative by many of the universities, supported by Best Practice advice, is expected to contribute to estimated overall carbon dioxide reductions of around 0.15 MtC by 2000.

216. The NHS has already taken some energy efficiency measures, including the installation of over 150 combined heat and power plants. It is committed to a further phase of energy efficiency activity, with a target of 20% improvement over 1990 levels by 2000. It is expected that this will lead to a reduction of around 0.4 MtC.

217. Forecast emissions for 2000, compared to the 1990 baseline, are set out in the table below. Forecasts are available only for the combined (commercial and public) services sector, and the estimate for the public sector is assumed for simplicity to be the same fraction of the total emissions for the services sector in 2000 and also in 2010.

	1990 (MtC equivalent)	2000 (MtC equivalent)
Carbon dioxide	8.7	7.8
Methane	0.9	0.8
Nitrous oxide	0	0
Hydrofluorocarbons	0.01	0.02
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	9.7	8.6

1995 is used as the base year for HFCs, PFCs, SF_6

PLANNED POLICIES AND ACTIONS TO 2008-2012

218. Forecast emissions in 2010 are set out below, alongside emissions from the baseline year of 1990.

	1990 (MtC equivalent)	2010 (MtC equivalent)
Carbon dioxide	8.7	8.8
Methane	0.9	0.6
Nitrous oxide	0	0
Hydrofluorocarbons	0.01	0.04
Perfluorocarbons	0	0
Sulphur hexafluoride	0	0
Total	9.7	9.4

1995 is used as the base year for HFCs, PFCs, SF_6

219. As with the commercial sector, carbon dioxide emissions from the public sector are expected to increase again after 2000, mainly because the continued growth in use of electrical appliances and air-conditioning is no longer offset by fuel-switching in the energy supply industry. Methane emissions are expected to fall sharply, perhaps by as much as 40%, due to improved waste management practices.

Central Government estate

220. We have produced a model policy statement and improvement programme for central government departments, agencies and non-departmental public bodies as part of the Greening Government initiative. This includes a commitment to using more efficient energy sources and on site combined heat and power systems; a requirement to procure more energy efficient equipment and appliances; and a requirement to draw up green transport plans.

221. New targets for the central Government estate are being developed. These will be based on benchmarks of good performance across the UK building stock as a whole, and are likely to be set at the top quartile level of the distribution for each type of building (eg naturally ventilated office, air conditioned office) using Best Practice Programme information. They should be in place during 1999. This new approach offers a number of advantages over the present method of measuring a percentage improvement in performance against a base year; for example, it allows for the inevitable changes in estate size and nature over time. All buildings will be expected to reach these benchmark standards, and overall departmental performance will be reported regularly. Benchmark targets will be a useful way of concentrating attention on the least efficient buildings, as well as ensuring that central Government estate remains at the forefront of good practice.

222. We will take a lead in producing green transport plans – looking at improving the way employees travel to work; our use of transport in the course of work; fleet management; and influencing suppliers' travel behaviour. All main buildings will have these plans in place by March 1999, and all other key buildings by March 2000.

Local authorities

223. Local authorities' role in promoting energy efficiency in the housing stock and in cutting transport emissions is covered in the *Domestic* and *Transport* sections of the paper. The issue of Building Regulations, implemented by local authorities, is discussed in the *Business* section.

224. Local authorities have a key role to play in reducing carbon dioxide emissions from the public sector as major energy users in their own operations as well as influencing patterns of energy use in their areas. We welcome the Local Government Association's draft policy statement on energy, which looks both at national energy policy and the efforts that authorities might themselves make, and look forward to seeing the final document.

225. We are also committed to supporting local authorities in bringing in green transport plans in their area, and will work with them to help secure widespread voluntary take-up through partnership with business and the wider community.

226. On waste management, *Less waste: more value* sets out proposals and some key principles on the need to minimise waste and make efficient use of the waste that is produced. In addition, we expect the EU Landfill Directive, when agreed, to require the amount of biodegradable municipal waste going to landfill to be reduced to 35% of 1995 levels by 2020. The move to higher levels of recycling and energy recovery for biodegradable waste will cut methane emissions sharply. Overall, emissions from landfill accounted for 43% of total methane emissions in 1990 and are expected to decline by 2010 as a result of waste and landfill management policies.

227. We will also continue to encourage the use of methane from landfills as a fuel source. Landfill gas projects have been supported by the NFFO and are now nearly cost competitive with conventional fuels. We will continue to encourage utilisation of the available landfill gas resource.

Schools

228. We are planning to delegate to schools all funding for running costs and building repairs and maintenance from April 1999. We are already planning to publish guidance this year on purchasing energy for schools, and will follow this up with further advice as appropriate. When all funding is delegated to schools there should be an even greater incentive, and greater freedom, to make energy efficiency savings.

National Health Service

229. We have recently announced additional resources for the NHS which will include an element to fund environmental as well as other projects, such as making building improvements. Further emission reductions would be possible through the installation of more efficient plant and equipment, particularly larger scale use of combined heat and power – though investment in such measures will need to be weighed against other spending priorities. The growth in energy-dependent medical technology and more intensive use of facilities mean that further improvements will be challenging, though some progress might be made in setting specifications and standards of energy consumption for energy-dependent medical equipment.

POSSIBLE FURTHER POLICIES

230. Energy efficiency initiatives within the public sector have made good progress over recent years. However, we estimate that it would be possible to save a further 10% of energy, equivalent to emissions of about 1 MtC, from cost-effective measures.

231. Targets for central government based on benchmarks will be demanding. Until the exercise is carried out for the first time, it is impossible to say what overall energy efficiency improvement such an approach would give. We provisionally estimate that a further 10% improvement by 2010 may be possible, corresponding to carbon savings of some 0.1 MtC each year.

232. Similar approaches may be possible in the rest of the public sector, although the level of carbon savings will vary depending on the achievements already made. We estimate that a further 10% reduction in emissions in schools and the NHS could produce around 0.15 MtC and 0.2 MtC respectively by 2010.

233. In many ways, the public sector operates like its similarly sized counterparts in the commercial sector, and so many of the measures that might apply to those ventures (covered in more detail in the *Business* section) could equally apply here. Its particular difficulties are the continually heavy demand for finite public resources, and that energy management, whilst pursued diligently at working level, is not always a priority for senior management. We envisage continuing our existing strategy of ensuring that available resources are spent sensibly to bring public assets up to the highest technical standards. This requires both Ministerial commitment and continuing financial investment in cost-effective measures.

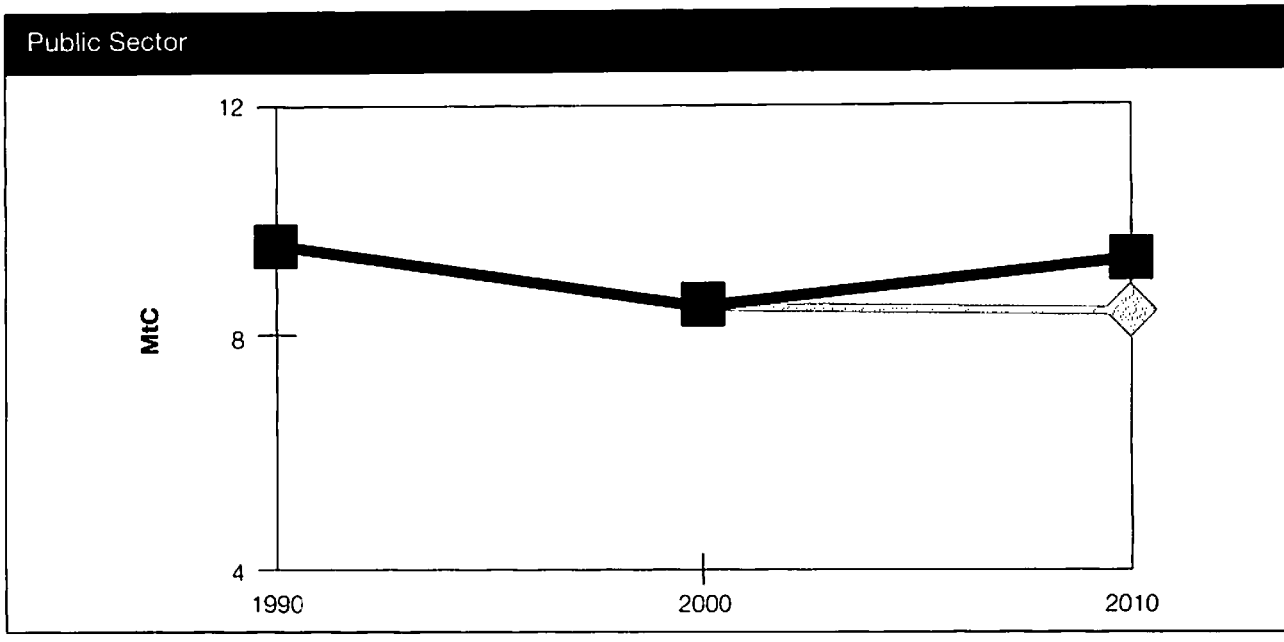
SUMMARY

Possible measures	Carbon Saving (MtC)	Cost/t C	Comment
Attaining new central government target	0.1		
New schools target	0.15		
New NHS target	0.2		

234. The table below suggests a possible classification of the available savings for the Public sector.

	Projections including planned policies and actions for 2010 (MtC)	Carbon savings from possible measures	Carbon savings from further possible measures
Public	9.4	0.5	0.6

This estimate of the level of reduction that these additional policies would deliver below our existing climate change programme is illustrated below.



Projected emission levels from the Public sector with and without possible measures

QUESTIONS

i) What level of savings might be achievable from the public sector?

ii) What new initiatives might be taken by the central government estate, by local authorities, schools, the further and higher education sector and the NHS? Are there lessons which can be drawn from other sectors, or is the public sector intrinsically different?

iii) What is the best way of setting targets for the public sector? Is requiring a standard a better way forward than measuring relative performance?

Additional copies of the consultation paper are available from:

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DETR Free Literature
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Tel: 0870 1226 236 Fax: 0870 1226 237

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